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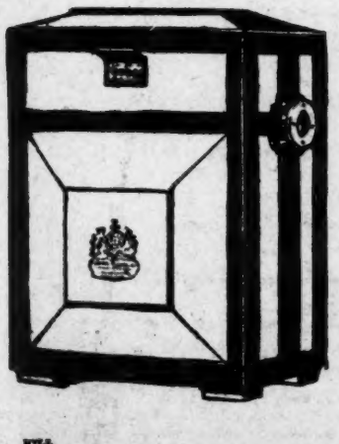

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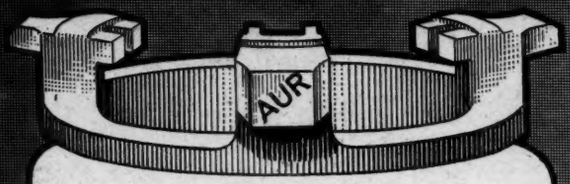

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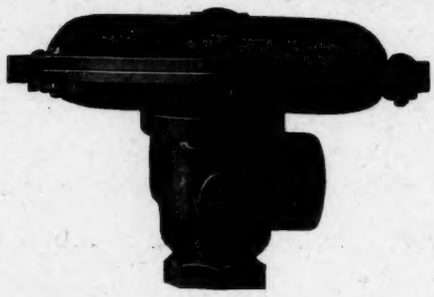

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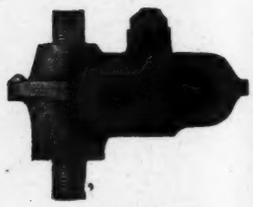

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CONTENTS.

EDITORIAL NOTES.

National Interests and the Industry's Control . . . 73
So Many Gas Units per Penny . . . 73
The Market for Coke-Oven Gas . . . 74
Mr. Grafton's Views on Current Topics . . 75
National Electricity Generation on a Commercial Basis . . . 75
Constructive Work on the District — Co-Operation with Gas Appliance Manufacturers — Standardization and Individual Requirements . . . 76

A District Governor for Pressure Control . . 76
Personal . . . 77
Electricity Supply Memoranda . . . 77
Factors Retarding Reconstruction . . . 78
Carbonization of Coal in Slot Ovens . . . 78
Machinery and Methods in Meter Making. By "Observer" . . . 79
Gas-Stove Makers and Munition Production —The Davis Gas-Stove Company "Under Government Control" . . . 80
The American Gas Association . . . 82
Manufacture of Gas from Wood and Peat—Swiss Experience in Commercial Practice. 83
Society of Chemical Industry — Chemical Engineering Group . . . 84
Coke-Oven Managers' Association (Midland Section) . . . 84
Scottish Gas Managers—Annual Informal Meeting and Conference . . . 86
Chemistry in Modern Warfare . . . 91
Manchester and District Junior Gas Association — Presidential Address of Mr. W. Fletcher . . . 92
Proposed Publicity Section in the United States . . . 94
Scottish Junior Gas Association (Western District)—Looking Around. By W. Grafton 95
Vertical Retort Steaming Tests at Springfield, U.S.A. . . . 97
Sir Dugald Clerk's Society of Arts Paper . . 98

CORRESPONDENCE.

The Proposals of the Sulphate of Ammonia Corporation . . . 99
Gas Units per Penny . . . 99
The Proposed Super-Station Electric Scheme 99
Gas for the Housing Scheme . . . 99
Re "Discontented" . . . 100

REGISTER OF PATENTS.

Gas Governors or Regulators — Weyman, J. E. . . . 100
Stills or Preheaters for the Dehydration of Tar—Blakeley, W. . . . 100
Control for Gas-Driven Vehicles — South Metropolitan Gas Company and Macdonald, R. C. . . . 100
Gas Cooking-Ovens—Allan, A. P. . . . 101
Applications for Patents . . . 110

MISCELLANEOUS NEWS.

Ballinrobe Gas-Works Coal Supply . . . 101
State Control of Electricity Generation—Nationalization of Plant and Financial Aid Recommended . . . 104
Alliance and Dublin Consumers' Gas Company—Half-Yearly General Meeting . . 104
Devon Gas Association, Ltd. . . . 105
Mr. Maurice Graham's New Work—Some Notes of What he has Done . . . 105
Stockport Gas Undertaking—Expert's Recommendations . . . 106
Current Sales of Gas Products . . . 107
Price of Gas at Hastings . . . 108
Swansea Gas Company's Good Fellowship Dinner . . . 108
Elstree and Boreham Wood Gas Company . 109
Gas Company Fined for Having Unjust Scales . . . 110
Stock Market Report . . . 111

PARLIAMENTARY INTELLIGENCE.

House of Lords—
Progress of Bills . . . 101
House of Commons—
Progress of Bills . . . 101
Sunderland Gas Bill . . . 101
Hartlepool Gas and Water Bill . . . 101
Profit-Sharing and Co-Partnership Statistics . . . 101
Northampton Gas Bill . . . 101
Workmen's Compensation and Disabled Men . . . 101
House of Commons Committee — Bournemouth Gas and Water Bill . . . 102

PARAGRAPHS.

Water-Gas Production—Colour Chemistry . 79
Gas-Fired Ovens for Malleable Iron . . . 91
Coal-Tar Returns Order Suspended . . . 94
Midland Junior Gas Association—Temporary Increase of Charges Act . . . 98
Trading Departments at Bradford—Benzol as a Motor Spirit . . . 101
Wages at Salford—Gas-Meter Testing in Glasgow . . . 103
Retford Gas Prices . . . 106
Strike at Cowes Gas-Works—Gas Stokers' Wages at Airdrie—Prices and Costs at Doncaster . . . 108
Gas-Works Contracts and Publicity—Rising Costs at Rochdale—Drogheda Gas Prices—Londonderry Gas Company . . . 109
Cost of Public Lighting at South Shields—Glasgow Gas Finances . . . 110
Loss by Suspension of Public Lighting—The Nechells Gas Tragedy—Irish Town in Darkness—Proposed Vertical Retorts for Ballymena . . . 111

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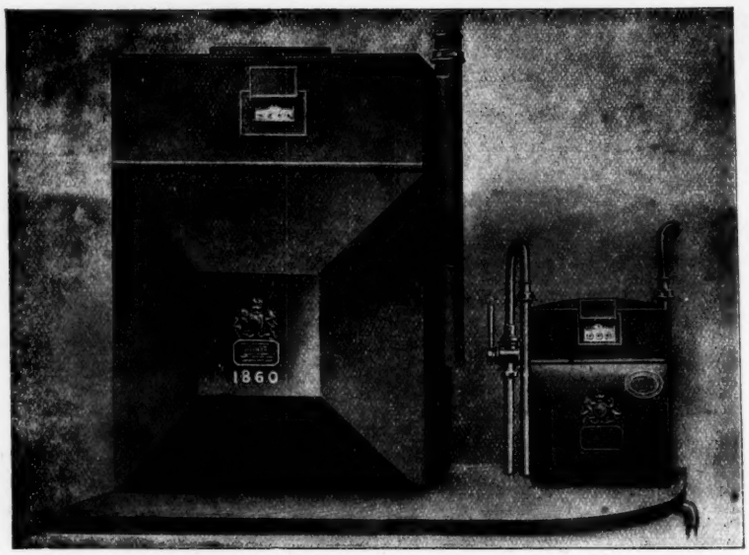

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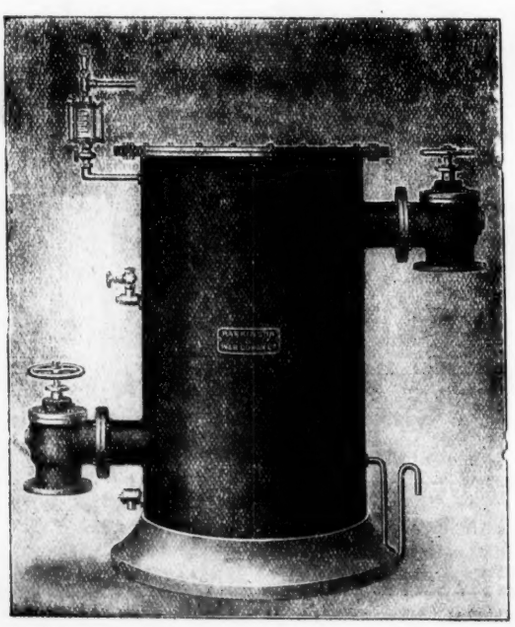

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VOL. CXLVI., No. 2917.] TUESDAY, APRIL 8, 1919. [71ST YEAR.

EDITORIAL NOTES.

National Interests and the Industry's Control.

IF the war has brought its troubles, it has also brought its rewards to the gas industry. It has hastened the industry along the road of development, and has urged it to establish itself there by perseverance, and not to be deterred or dismayed by the obstructions of decrepit ideals. Change upon change has come into the industry during the war; but the most valuable and welcome one that has been effected has been in the men of the industry. This change has been in their ideas. Without such change we could not get along. Before the war one of the most conspicuous features of the industry was the slowness with which new ideas and processes were accepted. With the then prevailing conditions, there was general contentment, which was not good, and was an enemy to progress; but need, with its foundation of heavy costs, has during the war had a quickening influence, and has driven home acceptance at a faster rate. When men's minds are made more receptive and are stimulated by the conditions around them, then there is better hope and greater assurance that movement will be more general in doing those things, and fighting for those things, that are necessary for the common good of the industry, and all that the industry stands for, and may stand for, in service.

The country is talking of coal conservation and industrial construction and reconstruction. The gas industry has been conserving coal and contributing more to those things that are necessary to industrial life and extension. What has been done was reviewed in a manner which exactly fits in with our own bent of mind by Mr. James Dickson, in his address at the Informal Meeting of Scottish Gas Managers. With him, we cannot conceive that what has been good for the nation in the working of the gas industry during war time will not be good for it during peace time. We cannot look at the saving of coal that there has been through steaming or admixture of blue water gas, at the saving of oil through the absence of carburetting or only slightly carburetting water gas, of the increase in sulphate of ammonia and tar per ton of coal carbonized, together with the 1½ gallons or so of crude benzol that has been extracted per ton of coal, without believing that this has all been for the good of the nation and the gas industry, and that procedure on somewhat similar lines will also be for their good in future. We have these developments before us. They are most alluring; they have excited interest and anticipation; they have broadened views. Commonsense is at work. The men of the industry are determined not to let the developments be wrenched from them, but rather to still develop upon achievement. While this is the feeling, we may go ahead confidently, knowing that, while obstacles will have to be surmounted, the goal will eventually be reached. Mr. Dickson in his address quotes pre-war yields of gas, coke, tar, and sulphate of ammonia. Let us remember that there was once contentment over them. To-day we look upon them in the light of the data provided by charge-steaming and dilution with water gas; and they appear to be of primitive order. We deplore, too, the waste there has been owing to progress not having taken place at quicker pace. The fault is largely that of the industry through its rule-of-thumb methods, and through treating research ignorantly and distantly. Mr. Dickson will not venture into prophecy as to how far the extraction of gas and other products may be carried; but it is obvious we have not reached the place where it can be said that economically we can go no farther.

But here let there be warning to those in high quarters who would put a statutory limit to our economic stride, in defiance of national interests. We do not imagine that in many places there will be complete gasification of coke. If this became general, we should expect that the prices of certain secondary products would go up to an extent that would tempt to a reversion from complete gasification to a greater carbonization of coal. Local circumstances, as Mr. Dickson points out, must affect choice of what is done in the way of diminishing coke for sale in order to enlarge the gas for sale per ton of coal handled. But we remember the pre-war coke accumulations, which the larger they reached, the more they reduced through low prices the revenue from the part of the coke that was sold. Better far that the surplus, or part of it, should be gasified and (where the process allowed) ammonia be recovered, and the gas made be placed at the disposal of the community for heating purposes. But coke accumulation was not the case in all places; local industries absorbed it. There are, in fact, some engineers who have such faith in the future of the coke market that they almost begrudge the difference in the coke for sale necessitated by steam-raising and the making of water-gas in retorts. Even in this respect, developments are proceeding that will materially reduce the proportion of coke used to steam raised, and so affect to the good the thermal balance of the carbonizing process. Local conditions, differences in quality of coal, and types, age, and condition of carbonizing plants, and present and prospective developments, all urge that there should not be a muzzling of the industry by too rigid standards, nor by a standard common to the whole industry. Gas supply should be treated as a national question, with coal conservation, consumers' convenience, cheap gaseous fuel, labour saving, prevention of air pollution by smoke, and all else taken into account. These are public questions, and should be dealt with by the public authorities as such; and their old notion that the industry's progress should be harnessed by unyielding standards should be at once abandoned. Price is an important thing in extending the use of gas for heating. The more of the thermal energy we can get out of coal in the form of gas—having regard to the conditions of use and the effect upon secondary products—the more B.Th.U. can be supplied to the consumers for a given sum. Consumers show no concern in the B.Th.U. supplied per cubic foot; nor do theoretical considerations weigh with them. But they do look at the amount which figures at the bottom of their accounts.

Therefore what the industry wants to do is to get Parliament to look at these and cognate matters—such as benzol extraction—from the point of view of national expediency, instead of the narrow one of the industry's control. The latter only exists and persists through custom; but with the new spirit that is abroad to-day, with the avowed intentions of the Government to pursue a constructive policy, there should be no difficulty in persuading Parliament that the gas industry can best serve the interests of its customers by serving at the same time the national interests. Any curtailment of its ability to serve the national interests will also curtail its ability to serve those of its immediate customers. For this view, there is very strong support in the address of Mr. Dickson, which deserves to be read from start to finish by every man in the industry.

So Many Gas Units per Penny.

THE subject of thermal efficiency is one which the question of coal economy has thrust well to the front in connection with national and industrial politics. The gas industry has well grasped the fact that it stands head and front among the industries in this matter of thermal efficiency in relation to the coal it uses; and it is its business to make the most of its superiority. It is working to realize a still greater

stability by drawing from coal and putting into gaseous form more B.Th.U. Occupied in this profitable work, the time is particularly favourable for considering the question of whether a new basis of charge cannot be brought about which will have relationship to the value of the gas distributed and sold. It is conceded that any fundamental change (if any) must be upon the heat basis. If this be accepted, the determination of the most rational method of application appears to be the only one for consideration. In the last three numbers of the "Journal," references have appeared to the plan tentatively submitted by Dr. Charles Carpenter. He suggested that a heat standard of gas charge should be 100,000 B.Th.U. Many men in the industry incline to the opinion that this is too large—that while a change is being made the industry should adopt a heat unit equal to the calorific value of an electrical unit (3420 B.Th.U.) The competitive advantage of this is obvious, if there are no sustainable objections. Mr. Walter Grafton advocated the adoption of the heat value of the electrical unit in the paper referred to elsewhere; but the consumers would not be particularly impressed with (taking the present price of Glasgow gas) an invitation to buy on the basis of 1 unit at 0·308d.; and the clerical staff might apply for higher wages and for shorter hours due to the mental damage which might ensue. Dr. Carpenter now sees no reason why, if there is any sound objection to 100,000 B.Th.U. as the gas unit standard, it should not be one-tenth of that—viz., 10,000 B.Th.U. This is coming nearer, but does not directly convey to the layman the thermal distinction that exists between gas and electricity. It would really make it worse for gas; as the charge per electrical unit (for heating) or gas unit (for all purposes) would be much the same, though the difference in value would be considerable. Here Mr. John West comes to the rescue, and asks in our "Correspondence" columns why 3420 B.Th.U. should not be adopted as the gas unit, and quotation be made to the public at 3, 4, or 5 units per penny, as the case may be. The gas man who can offer (say) 5 units for heating for a penny against the 1 unit of the electrical man will have an advantage which will be readily grasped by the public.

The Market for Coke-Oven Gas.

There is an affinity between the gas industry and the coke-oven industry which should be strengthened and not weakened; and we are at a stage now when very serious consideration should be given to this matter by the gas industry, or rather by those gas undertakings that are in closest proximity to coke-oven plants. Middlesbrough, Leeds, Sheffield, and other places have proved that there can be business relations of considerable mutual advantage; and other undertakings have indicated through parliamentary powers that they have their eyes on the possibilities of their geographical situation in relation to coking plants. We strongly advise every gas undertaking within convenient distance to do the same, and to lose no time about it. There are several reasons. Some of these can be summed-up in higher capital and producing costs for gas undertakings; and another is that the big electrical schemes that are at present being drawn into the political arena propose to tap every source of waste heat and of surplus gas, including coke-oven gas, with the view of economizing in fuel and costs. It is easy to show that the boiler-house is not the proper destination for coke-oven gas; and that in the cause of coal conservation, national economy, and public convenience, it should find its way into the gas-mains of towns, providing it can be delivered into them at a price which will represent a saving on the cost of production by ordinary gas-works plant. To utilize a gas of 450 to 500 B.Th.U. for electricity generation would be sheer waste, and ought not to be tolerated by Parliament. And the coke-oven industry should take its stand alongside the gas industry in representing this to Parliament, together with the request for greater statutory liberty for the gas industry, so that there may in future be a utilization to better advantage than hitherto of the gas produced by coking plants. The gas is not being wasted at present; but it is in the national interests that it should be put to the best possible use.

In last week's issue, we published an exceedingly thoughtful address upon this subject by Mr. D. V. Hollingworth [p. 28], and the discussion on it is given this week. There is special value in the address in that the author went from the gas industry to the coke-oven industry; and so is able to look at the matter from both points of view. Mr. Hollingworth is distinctly of opinion that the gas from coke-ovens should be directly used for light, heat, and power, and that it would be a wasteful application of it to convert it into electricity for these purposes. In short, there is greater national value in its direct burning to meet domestic and manufacturing requirements than in its indirect application through the medium of electricity. In using gas under a boiler for raising steam, and utilizing this in the current approved manner—in a turbine—for the production of electricity, some 26,000 to 30,000 B.Th.U. are required to be supplied in the gaseous form for the production of 1 kw-hour (3420 B.Th.U.). This statement of gas requirement is a very modest one. But, taking 26,000 B.Th.U., there is only a 13 p.ct. efficiency, while gas of the calorific quality of coke-oven gas can be utilized in gas-engines to give a thermal efficiency of from 25 to 30 p.ct., in gas-fires to give a thermal efficiency of about 75 p.ct., and for the hot-plates of cookers to give from 40 to 50 p.ct. efficiency. Moreover, there is promise that gas-ovens and boiler-rings of still higher efficiency than those at present used are almost immediately coming on to the market. Though the thermal efficiency of the electricity generating system is so low, the appliances in which the dearly obtained heat energy is used does not give 100 p.ct. efficiency. Sir Dugald Clerk pointed this out in his Society of Arts paper. Particularly is the efficiency miserably low for all cooking operations on the hot-plate and for water heating. The case is as complete as anything can be that coke-oven gas should be piped to centres where its value can be brought to the service of the community with better result than by consuming it under steam-boilers for electricity production.

As Mr. Hollingworth clearly shows, there is no difficulty in guaranteeing gas of from 450 to 500 B.Th.U., and of good character in regard to impurities. He does not see that there is any bar whatsoever to business relations between the coke-oven and gas industries. The only one is that of interruptions of supply. But, as he points out, interruptions of supply would be due to coal or transport strikes. Coal strikes would affect both industries. Perhaps there would be a little lag in the effect on gas undertakings if providentially they had good stocks. A railway strike, on the other hand, would affect the gas industry more than the coke-oven industry so far as supplies are concerned. The "Triple Alliance" would smile broadly if the components read these words. Any way, water gas-plant and the provision of coke and oil for a little carburetting are always possessions which add to comfort and confidence. Engineering never allows removable obstacles to remain in the path of realizable economies. Mr. Hollingworth suggests that there might be purchase by the gas industry of the coke-oven gas on the heat-unit basis. This would quite square with the new proposal to sell gas to consumers on the heat-unit basis. But whatever price was fixed, it should be on a sliding-scale based on the cost of gas coal delivered at the works taking the coke-oven gas. Mr. Hollingworth's ideas as to a price are rather liberally inclined to the coke-oven side, unless he is simply taking account of to-day's costs. He remarks: "Having regard to the published costs of the "manufacture of gas at gas-works, it would appear that "such works would be the gainers if they could purchase "suitable gas at a price after the order of 1s. 6d. per "1000 c.ft." They might on to-day's costs. Take the eleven corporation gas undertakings up North and in the Midlands included in "Field's Analysis" for 1917. Their net coal and manufacturing charges averaged 1s. 2·34d., compared with 8·75d. in 1913 (when Widnes was not in the group). We know all about capital and other charges having ascended, and the probability that they will continue higher than before the war. But on the quoted figures as to cost into the holder, the 1s. 6d. does not look remarkably attractive. Anyway, the towns that have already entered into engagements for coke-oven gas supplies have done so to the mutual advantage of themselves and the coke-oven proprietors; so that there should be no trouble in respect of price in other places. Certain it is the coking industry would do better from the gas industry with their gas than from the electricity industry. The latter can only afford the leanest of prices. Suppose the electricians used per hour 52 c.ft. of 500 B.Th.U. gas—say 50 c.ft.—under a boiler for the production of steam for generating 1 kw.-hour, Mr. Hollingworth's 1s. 6d. per 1000 c.ft. would run-out to 0·9d. per unit generated. And 0·25d. as the cost of current delivered has been bandied about through the newspapers in all quarters and corners of the country—much to the dismay and the uneasiness of central station engineers, who know there are

such conditions as the impossible and the finite. However, our coke-oven friends will have no difficulty in discerning which is the best market for their gas, where terms can be agreed; and we trust that Mr. Hollingworth's address will have some good effect in promoting the junction of forces wherever possible between the two industries.

While on this subject, we may refer to a matter raised by Mr. Hollingworth in his Presidential Address to the Coke-Oven Managers' Association in October last. The Ministry of Munitions has corrected and compiled during the war a vast amount of information relating to coal and shale carbonization, and to the yields of tar, ammonia products, benzol, &c., obtained from the different processes. It would be a pity if the statistics were kept locked up with the other departmental archives, and so have their value limited. They would be immensely informative if published, as they would mark the stage of technical progress as it exists to-day under the various systems of carbonization. Mr. Hollingworth through his address appealed for the publication of the statistics; the Council of the Coke-Oven Managers' Association have since done the same; and we add our appeal to theirs. If there is compliance, the technical men of the carbonizing industries will much appreciate it, and would regard it as some recognition and return for the trouble and worry frequently entailed in the filling-up during a time of severe stress, of the numerous forms circulated by the Ministry.

Mr. Grafton's Views on Current Topics.

The paper that Mr. Walter Grafton read at the annual meeting of the Scottish Junior Gas Association did not entirely meet with the approbation of members present. The title was "Looking Around;" and those who heard it were instigated by it to express, in very candid language, their views on points made by the author. He was accused of having made his survey with field glasses, and of indulging in pessimism. Where such criticism is justified, we are not sorry that Mr. Grafton gave cause for it, as it brought out testimony as to the prevalence among those present of a keenness in the work on which the industry is engaged in searching for the true lines of progress. Having said this, we may welcome the paper on the ground that critical examination of current movements, though in some respects opposed to the general view, is valuable, as it leads to a broader and deeper investigation of the subjects dealt with. Only by criticism and investigation do we finally arrive at the truth. There can be thorough agreement with Mr. Grafton that the industry's business should be made less dependent upon the sale of one commodity; and that (let us add) the most should be made of all sources of revenue, and of all possible applications of each commodity. This being so, despite his indirect suggestion as to retaining benzol in the gas, we see considerable value in fostering, by business connection with motorists, a reliance upon the industry for benzol, and so giving them a partial independence from the large dominating petrol interests. Commercial men know the value of extending the base of business association, especially when it can be done without detriment, but rather with profit, to the staple business. We are not inclined to think there is a large proportion of short-sighted individuals in the recently formed National Benzol Association.

However, it is seen that Mr. Grafton is fully alive to the value of trying to employ less capital, and to equip works so as to use less material and labour. The way in which he puts this point is a little nebulous. It is always difficult in a growing industry to employ less capital; and in these times, with costs for materials and labour what they are, the effort to do so will, we fear, go unrewarded. But there are methods of using less capital, material, and labour than would otherwise be the case per unit of output. They resolve themselves into increasing the output in relation to the quantity of material and labour employed. But Mr. Grafton is quite modest. He speaks of vertical retorts and steaming, and of 15,000 c.ft. of 500 B.Th.U. gas per ton. Many engineers have larger views than this. Some are looking hopefully to getting 20 to 25 p.ct. more B.Th.U. than is indicated here per ton of coal handled, with perhaps a little less coke for sale. And this is gas containing no inordinate quantity of incombustibles, but instead that hydrogen which, combined with the other gases, gives the excellent intensity of combustion which Mr. Grafton so much approves in the course of his attack upon "Pleno" gas, and when expressing disapproval, which is so widely shared, of spending money on gas distribution plant for the transmission to the consumers of altogether useless and avoidable inerts. He does not believe in steaming in horizontal retorts. Several engineers have attested a solid monetary advantage from doing so. He also believes that the most effective form of heating retorts is by the outside producer, with ammonia recovery; and he gives various reasons for his preference. The ammonia recovered would more than pay for the labour involved in the manufacture and the washing of the gas, which is a view that coincides with the experience of Mr. W. Chaney, of Birmingham. The most regrettable feature of the paper is the suggestion that all the public lighting should be handed over to electricity. Mr. Grafton will find himself in "icy isolation" in his views under this particular head. Edinburgh and many other places show methods of simultaneously lighting and extinguishing street lamps with gas as the lighting agent.

National Electricity Generation on a Commercial Basis.

Still another report upon electric power supply. This one is by the Chairmen of the different sections of the Advisory Council of the Ministry of Reconstruction, with Sir Henry Birchenough as President. Sir Henry and his colleagues have been considering the various reports that have been made upon the subject, and have endeavoured to extract from them something more practicable. Yet in the result support is given to the two very undesirable features of nationalization and State aid, against which a staunch stand is being made by (we think we may say) the majority of the foremost of our industrial leaders. On the other hand, there is the evidence that the Chairmen only favour nationalization and State financing on a purely commercial basis. They want nothing in the nature of bureaucratic control, but an organization commercial in character, and with rates charged for energy which would be below those now ruling, at the same time providing for interest on capital, for renewals of plant and amortization, and allowing a balance to be carried to the reserve fund.

We are afraid the Committee of Chairmen are hoping for too much. It will be a puzzle to have nationalization, State financing on the grand scale, and parliamentary control over expenditure without some considerable amount of bureaucratizing; and we are more than a little doubtful as to bureaucracy and commercial principles properly synthetizing. But we are not troubled so much about this as about the scheme producing revenue sufficient to provide a balance after meeting all the obligations named without having to come upon the taxpayers. There should be an assurance that this condition should prevail, and that if there was a shortage one year, it should be made up the next by those who draw on the main transmission lines for current. This should be an indispensable condition. We are afraid, however, that when the Committee talk about current being distributed at lower rates than at present (they are not suggesting the unfair course of uniform rates in all areas), they have too readily swallowed the computations of the earlier Committees, together with their visions of gigantic savings to the country. It is not difficult, given good water supply, to calculate what should be the cost of stations of specified output. But demand is not a very certain quantity, and distribution costs have not been measured. The expense of distribution is a matter that not a single committee have yet handled, or at any rate, if they have, no results have as yet been published. Everything relating to costs and revenue possibilities is in the crudest condition; and so there is a good deal of temerity about a body of gentlemen who can, in the present state of knowledge, hand to industry the hope of power at below the rates that existing electricity stations supply at, or at all events did supply at before capital and running costs were forced upwards by war-created conditions.

When the Chairmen so confidently recommend nationalization and State financing for the electricity industry, on grounds of the importance of power supply, we submit that coalmines, railways, shipping, iron-works, gas-works, water-works, chemical works, as well as the feeding of the industrial community, are all equally important—some more so. As a matter of fact, if the power costs of industries as they are run to-day (without power supplied from a national generating system, State financed) are examined, it will be seen that they really form but a small proportion of the total

outgoings of industry; so that power is not the real stimulating point in the matter of increased industrial production. All that electric power can do is but a diminutive part of what labour and a plentiful provision of cheap raw materials could do. There has, indeed, been a large amount of imagination brought to bear upon this question; and power has been pushed completely out of its proper place in the industrial system. The municipal bodies will not approve this report any more than they did the Power Sub-Committee's report, or any more than they do the rear position which electricity has been allocated in that wonderful structure—the "Ministry of Ways and Communications." The Committee of Chairmen appear to have completely shut-out public bodies from any administrative participation. The Chairmen do not even like the administrative constitution laid down by Sir A. Williamson's Board of Trade Committee, under which municipal bodies thought they would have the controlling power on the District Boards. Something much more simplified (as will be seen by the summary of the report in our news columns) is proposed by the Chairmen, in which Operating Executives take the place of the District Boards, serving under a Central Electricity Board. There will be no question here of whether local authorities or companies shall be top dogs. Now we shall be highly interested to see whether the Government will adopt the idea of attempting to blend nationalization and central administration with the principles of sound commercial enterprise.

Constructive Work on the District.

At the present time, owing to various causes, much attention is being devoted to the problems in dealing with coal which will increase the competitive efficiency of the industry, and help to rehabilitate its financial position. But simultaneously the outdoor departments must bestir themselves to do their share in restoring conditions and building-up new business. In this they will be aided the cheaper that thermal energy can be offered to consumers. There are, however, other things to be done which come within the province of the outdoor staff. In his address to the Manchester District Junior Gas Association last Saturday, Mr. W. Fletcher drew attention to several matters; and what he had to say is based upon the experience of methods which have, during the last decade, advanced the output of gas by the Liverpool Gas Company by upwards of 2000 million cubic feet. This is testimony which will command respectful consideration of the points made in the address. Strong ones are as to the necessity of educating consumers, and of having an effective system of maintenance. What Liverpool does in this respect is described in the address, and will be closely studied. Regularity of output has a very important bearing upon the costs of an undertaking; and Table D in the address is particularly striking. It gives the average hourly consumption for three days in December, 1917; and investigation of the figures will show what a remarkable effect the gas-cooker and gas-fire have had in bringing about an equality with the output during the lighting hours. A curve constructed from this table would not show any notably deep valley right away from seven o'clock in the morning to eleven o'clock at night time. We should like to see the corresponding figures for an average of three consecutive days in the summer time. The statistics speak volumes, and point to the direction in which we are to seek for the greater expansion of business, and to determine the best means of meeting it.

Co-Operation with Gas Appliance Manufacturers.

Among other things, Mr. Fletcher urges close co-operation with gas appliance makers. It would be a good thing if at one of their conferences the British Commercial Gas Association would arrange a discussion between the officials of the outdoor departments of gas undertakings and gas-appliance manufacturers, at which the former could speak their minds, and recount their experiences, so that the manufacturers could come into close touch with the views of those who have contact with the users of the appliances that they produce, and, on the other hand, the manufacturers could state what they believed would be mutually advantageous. Mr. Fletcher submits that greater energy and ingenuity must be put forward. For progress, that is a want of perpetual character. But we must give the manufacturers their due. Mr. Fletcher concedes that they have made wonderful advances with gas-furnaces during the war period; and this is especially the case in respect of heat efficiency. Heat efficiency as between furnace and furnace is hard to determine, unless the nature of the metal undergoing treatment, its bulk, and disposition are precisely on all-fours. But we do know that, by the aid of recuperation, and control of the waste heat passing away by the flues, the manufacturers have done and are doing good work in promoting heat efficiency. Also in regard to cookers and boiler-ring efficiencies, they have not been asleep during the war. But in connection with gas-fires, we should like to see manufacturers paying more attention to the supply of "radiants" showing better relation, in internal diameter, to the gas-flames. The report the Gas Investigation Committee presented at the last meeting of the Institution proved that there are gas-fires on the market that are totally unfitted, in the matters of regulation and suitability of fuel, to the gas of the times, though other fires show no loss of efficiency with a fairly long range of difference in composition and calorific power.

Standardization and Individual Requirements.

There is, however, one way in which the officials of gas undertakings can materially help the gas-appliance makers today. Gas undertakings want to get district work into full swing again as quickly as possible; but many officials are doing their best to block rapidity of output by incorporating in their orders all sorts of little constructional fancies, which cause delay at the manufacturers' end, and impede not only the execution of the order, but the quick turning-out of appliances for other concerns. Manufacturers are harassed in these times just as much as are the officials of gas undertakings. Materials, labour, and costs are shackling them in precisely the same way; and any departure from standardized goods only increases their difficulties. The correct course—until at any rate things become easier—is to select the best patterns (and let them be the best) of standardized goods, and help matters in these times by adhering to them. Standardization does not mean the end of improvement. Improvement can be applied to, and become part of, standardized models as we go along. But at the present time do not let small individual notions interrupt the rate of output. Each should do his part to accelerate it, so that demand can be satisfied.

A District Governor for Pressure Control.

Mr. C. H. Smoot, of New York, has described in the American "Gas Age" a new type of district governor for pressure control, the novel and fundamental principle employed in the design of which, he says, "is that of multiplying the small departures from normal value of the regulated condition by several hundred, and using the multiplied pressure to operate the regulator. By virtue of this multiplication, the small departures from normal value of the regulated element become large and powerful departures which have ample energy for overcoming friction and other interfering actions, and permit the moving element of the regulator to operate with powerful effort, even when the original departures from normal value of the pressure to be regulated are very small." In the new form of multiplying regulator, the pressures active to move the valve are several hundred times as great as they are in the case of the older types; but regulators of the bell-operated pattern already in service may be greatly improved by substituting for the bell a new type of multiplying top, giving perhaps 150 times as much force to move the regulating valve for a given error in regulated pressure as was previously obtained by means of the bell and water tank. The new type of regulating tap has a diaphragm element operating the valves; and underneath the diaphragm is a pressure device, the changes in value of which are approximately 400 times the corresponding changes in regulated pressure—more than ample to overcome any possible amount of friction caused by tar, corrosion, lack of oil, &c. The power and accuracy of this type of regulator are said to overcome most of the difficulties in pressure governing. The regulating valves will not stick; and the pressure control practically eliminates hand adjustment.

Sir William Crookes, O.M., F.R.S., whose brilliant scientific career made his name a household word, died in London last Friday morning, at the age of 86. As long ago as 1875, his researches led him to the construction of the radiometer, which consisted of a number of light vanes mounted round a delicately poised vertical axis, and suspended in a partial vacuum, each vane being blackened on one side and polished on the other. When exposed to light, the vanes rotated. He had been President of both the British Association for the Advancement of Science and the Chemical Society; and in the former position he described, in his address, a new member of the rare earth group—monium or victorium. He suggested, in connection with the problem of wheat supply, that the only hope of averting world starvation lay in the artificial fixation of atmospheric nitrogen; and in another direction, he devoted considerable attention to the properties of radium.

PERSONAL.

Alderman William Kay, the Chairman of the Manchester Gas Committee, has accepted an invitation of the Selection Committee to act as Lord Mayor of Manchester until November next. The vacancy was caused by the death of Alderman Makeague.

Mr. Robert Tindall has been obliged, through illness, to resign his seat on the Board of the Imperial Continental Gas Association. Having been elected on Oct. 19, 1892, he has served nearly 27 years, and holds the Association's Long-Service Medal, which is presented to Directors, staff, and workmen on completion of 25 years' service. Mr. Tindall's absence from the councils of the Association will be keenly felt by the Directors and the staff. It is not intended to fill the vacancy created by his retirement.

Mr. Maurice Graham has been appointed by the Anglo-Persian Oil Company, Ltd. (with whom the Admiralty are closely allied financially), as Consulting Engineer for the construction of a large oil refinery near Swansea. The site area ranges over 2 miles, and extends to the docks; and the scheme includes railways, jetty, power-houses, process units of plant, reservoir, tank, farm, &c. Some particulars of Mr. Graham's career will be found on a later page of this issue.

At the City Hall, Waterford, Mr. J. Paterson, the Manager of the Waterford Gas-Works, was presented with a handsome testimonial by the Company's staff and employees on his leaving for Deal. A suitable gift was made by the staff to Mrs. Paterson. Mr. Henry Smyth presided, and paid tribute to Mr. Paterson's success during his five-and-a-half years' stay among them, and to his popularity at the works and with the citizens. Mr. Paterson, in reply, said the past twelve months were the hardest he had ever had to put up with. The Directors had not been unmindful of his services; and they also had made him a handsome presentation.

There has been submitted to the Glasgow Gas Committee a letter from Mr. R. Halkett, the Assistant General Manager, intimating his resignation, in view of his appointment as General Manager of the Sheffield Gas Company. The Chairman and other members of the Committee having made suitable reference to Mr. Halkett's services to the department during the past six-and-a-half years, as Commercial Superintendent and latterly as Assistant General Manager, it was agreed to record the Committee's high appreciation of these services, and an expression of their best wishes for his future success. The minute was approved at the meeting of the Corporation last Thursday.

The Drogheda Corporation had under consideration 27 applications from various parts of the kingdom for the position of Gas Manager and Secretary, vacant through the resignation of Mr. H. W. Saville on his appointment to Wexford. A Committee reduced the list to four; and finally Mr. P. J. Fitzpatrick was elected. Mr. Fitzpatrick has been actively engaged in gas-works for 28 years, and has been for thirteen years the Manager of the Maryborough Gas Company. His father was for over twenty years the Manager of the Cahir Gas-Works. Mr. Saville thanked the Corporation for all the kindness extended to him during his stay in Drogheda; and congratulations were extended to him on securing a more lucrative appointment—regret, however, being expressed at his leaving Drogheda.

There was a gathering last Thursday of the staff and employees of the Hornsey Gas Company, to do honour to Lieutenant A. Holloway, M.C., and Sergeant A. H. Hayter, M.M. As soon as it was known that they had been demobilized with the distinctions indicated, it was decided to show in some tangible form appreciation of their services in the war. The Engineer and General Manager of the Company (Mr. J. W. Buckley) presided, and presented to the gallant soldiers cases of mathematical instruments and various scientific books, together with suitable addresses. In making the presentations, Mr. Buckley congratulated the recipients on their distinguished service in the army (both having been promoted from the rank of private), and trusted it would be an incentive to them to make the same effort in civilian life towards promotion. One of the objects—if not the chief—of the presentation was to assist them in this direction. There were no doubt many who would be disappointed because they had not been decorated for their services; and he felt sure the recipients would support his views when he said that many brilliant deeds—perhaps the equal of those they were now honouring—had been performed without recognition. This was the case also in ordinary life, where honours and rewards did not always come to those who deserved them. He added that no less than 108 (or 43 p.ct.) of the officials and employees of the Company had served with the Colours; and it was deeply regretted that 15 p.ct. of these had made the great sacrifice.

The British Science Guild are arranging a British Scientific Products Exhibition, to be held in the Central Hall, Westminster, from July 3 to Aug. 5, to illustrate recent progress in British science and invention, and to help the establishment and development of new British industries. The exhibition will be divided into a number of sections, including chemistry, electrical appliances, engineering, fuels, and metallurgy. Arrangements are being made for the delivery of lectures upon important lines of progress; and conferences will be held to promote an exchange of views between makers and users and scientific workers and industrialists.

ELECTRICITY SUPPLY MEMORANDA.

We are well pleased with the reception that Sir Dugald Clerk's Society of Arts paper has received at the hands of the electrical papers. We hardly expected that our contemporaries would pass over the production in silence; but we little thought there would have been such a choice display of superficiality in dealing with it as there has been. The comments have run very much in like grooves. In not a single case has there been criticism of the thermal efficiency calculations that were so plentifully woven into the composition of the paper. As a matter of fact, the charge that there is a heavy waste of the thermal energy of coal through the operations of the electricity industry—particularly where heating is concerned—has been accepted with a unanimity which shows that the charge has been fully proved. The electricians absolutely decline to touch the data which Sir Dugald had so carefully calculated. Studying their own comfort, their wisdom in this evasion of facts is unquestioned. All they have been able to do is to say that thermal efficiency is not everything; and, of course, nobody has suggested that it is. But it is important; and, in heating, the most important consideration. The electrical people have to fall back on the convenience of electricity. But convenience can be purchased too dearly; and it is heat that the bulk of householders wish to purchase for room heating, cooking, water heating, and so forth. It is the value for their money that weighs with the majority. Some people use taxi-cabs because of convenience; but the mass of the people have recourse to tubes, trams, and buses. Yet the taxi is more convenient and comfortable. There are other factors than convenience and comfort that tell. Anyway, it was a shrewd and convenient decision that caused the electricians to leave Sir Dugald's figures severely alone, and to take the easiest possible course in their references to the paper.

No Argument on the Thermal Basis.

The writers in the electrical papers overlook entirely in their comments certain points which they apparently cannot now defend. Sir Dugald Clerk was not responsible for the selection of the thermal basis—valuable as it is—as the proper line on which the paper should proceed. The real origin of the paper was the report of the Power Sub-Committee of the Coal Conservation Committee, and that of the Board of Trade Committee. Now in these reports, millions upon millions of tons of coal were presaged as the savings, together with millions upon millions of pounds sterling, if coal were converted into electricity, and the current so produced, at a loss of nearly nine-tenths of the potential heat energy of the coal (at present the average loss is about 95 p.ct.), was employed for power and heating. We do not remember that the electrical papers questioned this line of argument on the part of the Committees; but we do remember gentle hints to the Committees that this line had perhaps been a little overdone. But there the electricians have stopped; and now that the ground chosen by the Committees has undergone competent exploration, they do not approve of it. If our electrical contemporaries had themselves exposed the fallacy of such great expectations in regard to coal saving not only for power but for domestic heating, it would not have suited the book of the industry, and so they preferred to remain grimly silent. There was another obvious object in Sir Dugald's paper; and this was to show that the question of the best possible utilization of the nation's coal resources had not been investigated through and through. Had it been, all that he disclosed as to the inferiority of electricity to gas for various important services would not have been ignored; and the Power Sub-Committee would certainly not have drawn such fanciful pictures as to the coal economies and household coal-delivery savings that would ensue from the substitution of electricity for coal. They would have found greater value in the utilization of gas in the household. We must not forget that the work of the Power Sub-Committee was directed to "coal conservation," which is a national matter, and not one for a single industry. Let the electricians approach Sir Dugald's paper from that point of view, and then let us know what they make of his data.

From the Standpoint of Coal Conservation.

The electricians decline to look some facts in the face, and refuse to accept them if gas has anything to do with them. Take this foolish little comment of "Meteor" of the "Electrical Times" as an example:

A Foolish Comment.

> Gas, it seems, will deliver to the customer four or five times the heat units that would be passed on to him from the coal electrically. We are not told what becomes of these units after reaching the consumer's side entrance. They are delivered—so it is alleged; and if the consumer likes to waste 80 or 90 p ct. of the beautiful B.Th.U. wrapped up in gaseous form, presumably it is his own butter-fingers that are to blame. Apparently he is so extremely dexterous with the electrical B.Th.U. that every one of them is usefully absorbed. And possibly this accounts for the curious preference so often manifested by the satisfied electrical consumer. He credits us with superior results which really should have accrued to gas—only they didn't.

Will "Meteor" kindly tell us where in domestic work 80 or 90 p.ct. of the B.Th.U. delivered to the consumer by gas is wasted? The modern gas-fire renders service to the consumer by giving him in

the form of useful heat to the room 70 to 75 p.ct. of the cheap B.Th.U. supplied to him. "Meteor" cannot point out any electric radiator that actually gives 100 p.ct. efficiency; and the B.Th.U. supplied to it are much dearer than those delivered to the gas-fire by gas, owing to the electrical B.Th.U's. having been obtained at a much greater expenditure of the heat energy of the coal. Neither Colonel Crompton nor "Meteor" can prove to us that the modern gas-fire does not give a radiant efficiency of something like 50 p.ct.; the balance of 20 to 25 p.ct. being in the form of convected or conducted heat. Then again where is the electric oven or hot-plate that "usefully absorbs" every one of the B.Th.U. supplied electrically? Electricians cannot be proud of such comment as that quoted in this paragraph.

Householders and Electric Radiators.

It will be remembered that Colonel Crompton was one of the speakers in the discussion on Sir Dugald Clerk's paper; and he it was who referred to the usefulness of electric radiators for the aged, ill, and infirm, because they can be brought close to their bodies. This we quite believe. He also said: "The radiating power of the sun can be imitated to some extent by the electric radiator; and I defy you to do it with any gas-radiator I have ever seen." Such defying was an excellent piece of stage play, because the gas appliances that are called by custom "gas-radiators," fall far short of compliance with nominal description. But the gas-fire is something different. Of the heat generated by the combustion of the gas, it gives off a luxuriant proportion by radiation; and this is what makes the modern gas-fire so popular. Colonel Crompton was presiding the other day at the meeting of the Kensington and Knightsbridge Electric Lighting Company. He mentioned that last year there was a reduction of 11·6 p.ct. in the units compared with 1917. The reported explanation of the heavy reduction is this: "The reason why they compared unfavourably with 1917 was that during that year many consumers, owing to the coal difficulty, installed electric heating apparatus, the effect of which was to cause an increase in the sale of electricity for heating. But the further restrictions upon the use of electricity which were made very severe during the past year had more than wiped-out the gains made in 1917." This is interesting. The additional installation of electric radiators in 1917 was "owing to the coal difficulty." Nothing else. And what cared the user of the electric radiator that his adoption of this form of heating meant a wasteful expenditure of solid fuel at the generating station not very far away. As many gas-fires were installed during the year 1917 as the gas companies could provide with the men and limited supplies at disposal; and the householders were fortunate indeed who succeeded in getting them. But coming to last year, the restrictions imposed on the use of electricity, Colonel Crompton says, "more than wiped-out the gains made in 1917." The Colonel should recollect that the restrictions were not severe on the use of electric energy for heating purposes—800 units (now 1000 units) having been allowed as the equivalent of a ton of coal. Colonel Crompton's own admission, viewed in the light of the allowance per ton of coal, shows conclusively that something other than restrictions were at the bottom of that very effective wiping-out of the gains of 1917. Lord Downham, at the recent meeting of the Westminster Electric Supply Corporation, stated that a large number of hired electric heating appliances had been returned by the users.

National Power Topics.

Mr. C. H. Merz is a member of the firm who are the consulting engineers to the Newcastle-upon-Tyne Electric Supply Company; and he was a member of the Departmental Committees who considered the subject of electric power supply on a national scale. Therefore interest attaches to the statement made by the Chairman of the Newcastle Company (Mr. J. H. Armstrong), that, though electric power supply is now under consideration by Parliament, it is not likely that there will be disturbance for some time to come. We rather think Mr. Armstrong was referring to the Company, because the view held by the Board and Mr. Merz is that the concern is the one electricity supply model in the country that is worth copying. The remark as to the improbability of immediate disturbance might be applied generally. What has been done up to now is only the broadest outline of the plans; and it will take an immense time to get the machinery into order, plans prepared, and actual work started. Turning from the North-East Coast to South Yorkshire, we see that Sir John Snell and Mr. Merz have been investigating for the Sheffield and Rotherham Corporations, the Sheffield and Rotherham manufacturers, the South Yorkshire coalowners, the North Lincolnshire ironmasters, and the Yorkshire Electric Power Company, the question of a scheme for the supply of electricity to South Yorkshire and North Lincolnshire, comprising an area of about 1200 square miles. They report that any area with industries of such magnitude and variety as that under consideration should be supplied with electrical energy from one interconnected system, since by this means the best advantage is taken of the effect of diversity of load on load factor, and the fullest utilization of the waste heat available is made possible. It is estimated that, taking into account the extensive alterations and additions projected in various steel works, the development of electric steel furnaces, and the probability of a considerable electrification of the railways, &c., the total load will eventually grow to a figure of not less than 680,000 kw., and probably 750,000 kw., which latter figure is equivalent to a generating plant capacity of over 1,000,000 h.p. The waste energy available in the district, from coke-ovens, exhaust steam, and blast-furnace gas is an important item, of which full advantage could be taken were a central generating station established; for it is estimated that from this source a continuous output of 60,000 kw. would result during the first year of operation. A site on the Trent, either at Keadby Bridge or Gainsborough, is, in the opinion of the reporters, the right policy at which to aim. It is suggested, therefore, that arrangements should be made to write-off, as soon as possible, sufficient of the capital sunk in the three stations—Neepsend, Blackburn Meadows, and Rotherham—to allow of their being treated as auxiliary or stand-by stations. A three-phase high-tension primary transmission system operated at 50 cycles per second, at a pressure of not less than 33,000 volts, should be laid down on standard lines over the area (though these need not be standardized for all time) to supply distribution networks operated at a standard pressure of 10,000 to 11,000 volts, which would be laid out and so designed that they can eventually be linked-up into one general system. To meet the estimated load in 1923, new capital of from £11,000,000 to £12,000,000 will be required; and Sir John Snell and Mr. Merz state that they are satisfied that this will be thoroughly secured and remunerative. With coal at 15s. to 16s. per ton, they estimate that energy at 11,000 volts could be delivered on a paying basis to consumers at an average cost of 0·394d. per unit. Elsewhere, we see that Mr. Napier Prentice, of the Suffolk Electricity Supply Company, states that his Company have urged the Board of Trade to include in the Power Bill authorization to purchase the gas company's interests in any district where the national scheme is put into operation. We have heard of gas companies taking over electrical supply interests, but not the reverse order of things. Anyway, the proposal mentioned by Mr. Prentice indicates that he and his company recognize that gas is a power in the land that will not be extinguished by any electrical power scheme.

Factors Retarding Reconstruction.

The circumstances operating at the present time to impede the reconstruction and expansion of our peace industries form the subject of a memorandum written, at the request of a Government Department, by Mr. D. A. Bremner, O.B.E., a Director of the British Engineers' Association, of No. 32, Victoria Street, Westminster, by whom it is issued in pamphlet form. The principal retarding factors are placed under twelve heads; and these are afterwards commented upon. The first is labour unrest, which is declared to be the prime and dominant cause of industrial retardation; and as to this, the author says the crying need of the moment is scientifically conducted economic propaganda of a non-partisan character. The economic structure of the State and the Empire must be laid bare to the public eye; the economic laws governing the material well-being of the community and limiting the rate of approach to ideals, must be explained in language understood by the man in the street. In view of the fact that we have to work against time, Mr. Bremner urges that this task should be performed as well as may be possible now, instead of delaying in the expectation of being able to do it better some day. Of the other causes named, one is the inadequacy of pre-war working capital to meet present-day requirements, having regard to its reduced purchasing power; another is uncertainty as to changes that may take place, even during a short future period, in the prices of raw materials and other constituents of production costs; while perhaps the most striking of all is "the disquieting effect of the knowledge that the Government have to dispose of surplus stores to the value of about £1,000,000,000."

Carbonization of Coal in Slot Ovens.

A correspondent of the "Gas Record" [Chicago] has been inspecting at Ann Arbor, Michigan, a "slot-oven" carbonization plant erected for the Washtenaw Gas Company. These ovens embody the underlying principles of coke-ovens, but on a scale suitable for the smaller companies. There are now many of these plants in operation, although Michigan, for several reasons, has more of them at work than any other State. By replacing their old benches of horizontal retorts with this type of oven, the Washtenaw Company have increased their gas make on the same foundations from 65,000 c.ft. to approximately 110,000 c.ft. per bench; while at the same time the labour has been reduced by one-half. The old retort-house was utilized for the installation; six benches of three ovens each replacing six retort-benches of sixes. The ovens are 12 in. wide, 6 ft. high, and 13 ft. 6 in. long, fired by standard three-quarter depth furnaces. The high temperature at the top of the ovens at first caused some difficulty from the formation of pitch in the hydraulic and foul mains; but this trouble was eliminated by the installation of a crude liquor flushing system. Sprays are installed throughout the hydraulic main near each dip-pipe, in the off-take pipes leading to the foul main, and in the foul main itself. A Doherty washer-cooler, which deals with the hot gases from the ovens, provides the crude liquor for the flushing system. Three benches of ovens were put to work in February, 1917, and the other three at the beginning of 1918. The Company are obtaining an average of 5·3 c.ft. of gas per pound of coal carbonized, with an average heating value of 610 B.Th.U. The ammonia and tar yields are normal. The installation was described at length in the "Journal" for Dec. 24 last, p. 660.

MACHINERY AND METHODS IN METER-MAKING.

By "Observer."

The art of gas-meter making—that is meters of the "dry" type constructed of tinned-plate—is one not so readily adaptable to the development of mechanically-operated methods, and to machine produced facilities, as one not intimately familiar with the industry would be inclined to expect.

The dry meter of to-day is in essence the dry meter of 70 years ago. In principle and operation it has, from the time when the Croll and Richards dry meter was first patented in the year 1844, undergone practically no change whatever—certainly not fundamentally. An old meter-maker who had nearly 60 years of meter-making to his credit once told the writer that, in his early days, a soldering iron, a pair of snips, a hammer, a block, and a stake were about all the equipment necessary to make a meter. Unquestionably, the man behind the soldering iron is to-day, even as then, the chief factor in the making of a meter. It is extremely interesting, as well as curious, to realize that so little development in principle and operation of a gas-meter has been made since it was first invented. Curiously enough, this applies equally to wet meters. Indeed, it is questionable if a parallel to this can be found in any of the mechanical sciences.

Take, for a moment, the wet meter. Introduced in the year 1815 by Clegg, perfected a few years later by Samuel Crosley, finality was reached in its earliest stage by the introduction of the hollow drum divided into compartments, and rotating, within an outer case, in water; gas being admitted at one end of the drum and finding an outlet at the other—the cubical capacity of the portion above the water line constituting the measuring chamber. This was Crosley's wet meter. It is also the wet meter of to-day. And there is recorded no change of principle or application.

The same with the dry meter. Practical finality would appear to have been reached in the very earliest attempt of the initial patentee, in that the outer case was divided into three compartments or chambers—the two lower ones containing the measuring diaphragms, the upper one receiving the valves and the valve-operating mechanism. Of the several attempts since that time to depart materially from the fundamental principles then laid down, not a commercially successful one exists.

The earliest evidence of substantial mechanical development in the production of dry meters would doubtless date from the employment of power presses for cutting out and blocking the several body parts of a meter case, and imparting the raised, square-pattern appearance of the fronts and tops characteristic in almost all makes of meters. Then followed the stamping and piercing of the various internal members in tinned plate—the upper division plate carrying the valves, the diaphragm discs, the hinge pieces, index frames and covers, valve connections, and, in the case of prepayment meters, the several parts constituting the attachment, covers, and coin-boxes.

Obviously, the construction of dry meters was influenced not inconsiderably by the adoption of machine methods and the production of so many and varied important parts all exactly to gauge and standard dimensions. And, as a very natural consequence, assembling became also more of a mechanical process than a skilled operation dependent upon the craftmanship of the worker and his aptitude in handling his tools. It also eliminated many intricate and tedious hand operations, reduced considerably wastage of material, and permitted higher grade work being done by less experienced labour.

In several meter-making shops known to the writer have been tried various "improved" forms of soldering irons, or copper bits—gas or electric heated, others having "patent" holders or handles, others, again, being fitted with a "bit" of peculiar shape or substance not wholly copper. The general opinion of those who have experimented with them is invariably that they are freaks; and no amount of persuasion or other measures more forcible seem to alienate their preference for the old-fashioned tool.

The facing of valve-seats and valves is a further illustration of the strange adherence of both employers and workmen to old methods and long-established customs. In one shop known to the writer, a great deal of money was expended in laying down a machine fully equipped with tools and jigs to quickly mill, on the gang principle, the valve seatings and valves; then finally passing them through another machine where they were given a perfectly accurate and smooth face by grinding. Now one would naturally have thought that such methods were far and away preferable to the old one of hand grinding on different grade stones, and the use of fine sand as an abrasive material. But no! A later visit to the shop in question revealed the fact that the machines were taken down, and the old methods reverted to. The explanation given was that machine-produced valves and seatings showed much greater proportion of leakages, and were therefore just as costly in the end. This, of course, is open to doubt.

Because of its important bearing upon the tightness of a measuring chamber, one of the most responsible, if not difficult, operations in meter-making has been the tying of the leathers to the diaphragm rings. This is usually done by means of a number of turns of fine, strong cord, firmly tied, then given a coating of hot glue. Purely a hand operation, until a few years ago it needed a very skilled craftsman to make a reliably sound job. Of late years, however, a special machine, designed with an expanding sectional head to firmly grip the diaphragm ring, and arranged to rotate while the cord is held in tension, has brought this operation within the limits of quite unskilled labour—a boy or girl of average intelligence being capable of more than quadrupling the output of a skilled man by the older method.

The mechanism of a dry meter provides an outstanding example of crude simplicity. But it is simplicity with extreme effectiveness. And herein is to be found the reason why fundamental principles embodied in the earliest form of meters have never been materially changed or superseded. Both measuring and operating mechanism is altogether devoid of complication and weak and doubtful elements, and, given a skilled hand behind the soldering iron, assembling is reduced to a business in which risk is ridiculously disproportionate to the importance and efficiency of the finished article.

To watch a mechanic building a meter having the finished sections on the bench before him, is both a revelation and an education. All the requisite holes and slots are there, beading and bending operations are complete, a nick, or a slight cut, or some other form of distance mark has been set out by the machine during the operation of forming which provides a definite and reliable guide for the assembler. And truly wonderful degrees of ingenuity are displayed in the many and varied little "kinks" designed to aid both accuracy and location. A piece of curiously bent wire, with a strip of tin attached, becomes a handy form of jig for locating a bearing point for a valve arm; a simple rod, having a screwed cap, passing down through the divisions of the case on to a cup bearing at the bottom, determines the exact position of a stuffing-box. A single touch with the soldering iron, and its position is fixed and unalterable. This curious looking pad of damped felt, secured in a tinned-iron square frame, and provided with a convenient handle, one wonders what part this plays in the assembling of a meter. Presently it is taken up in the left hand of the operator, and held firmly against the inside of the case, while an outer joint of the case is being soldered. Then it is explained that, without this as a cooling medium, the heat from the soldering iron would in all probability tend to buckle the case, and give it an unsightly appearance. All of which supports the claim that, despite the advance of mechanical production and machine-controlled methods, the art of meter-making is still, to a very great extent, dependent upon the human element—the man behind the soldering iron.

The attachments of a meter—that is to say, the valve operating and recording mechanisms, together with the index, inlet and outlet connections, and, in the case of prepayment meters, the coin-operating mechanism—are wholly the product of machinery and machine tools. In fact, the production of these portions of a meter involves the laying down of a fairly wide and comprehensive machine-tool plant. This would include automatic and hand capstans, milling and gear-cutting machines, stamping presses, worm and thread cutters, single and multiple spindle drilling machines, and, in some cases, a die-casting plant. Supplementary thereto would also be required a fully-equipped tool room for the production of the necessary press tools for blanking, forming, and piercing, and for the general maintenance and upkeep of the many and varied forms of tools used in the different types of machines and mechanical processes. Comparatively little hand labour is involved beyond the actual production of the attachments of a meter; and provided the machine tool equipment is sufficiently comprehensive and complete, the greater proportion of the labour employed thereon can be of the semi-skilled variety—lads and females particularly adapting themselves to this branch of service.

It is, however, not unusual to entrust the assembling of the index parts, as also the coin-actuated attachments, to higher skilled labour; for herein the chances of error and inaccuracy are more abundant than in any other part of a meter.

Water-Gas Production.—According to "Engineering," when investigating the production of water gas and especially the decomposition of steam by red-hot charcoal, Herr Gwosdz ("Verhandlungen Verein-Beförderung Gewerbefleiss," 1918, pp. 33 to 45 and 55 to 70) finds that carbon monoxide can be produced at relatively low temperature when the coal contains very little ash. The first primary products are carbon monoxide and carbon dioxide in equilibrium percentages. At the surface of the coal, however, more carbon dioxide is produced by the interaction between the steam and the glowing coal; and this latter reaction depends not only upon the surface of the coal, but also on the ash content.

Colour Chemistry.—Dr. A. E. Everest, in a paper on "Some Future Possibilities in Colour Research," read before a meeting of the Manchester Section of the Society of Dyers and Colourists, said it would be of interest to observe how far in the future industries would compete for the waste products of gas making, for use in other directions than in the production of coal-tar colours. An enormous amount of work had been carried out upon the derivatives of naphthalene; and in developments in this direction the fact that there was not much competitive demand for naphthalene had played a great part. For recent developments in colour chemistry, dye manufacturers were largely indebted to English tar distillers, for placing at their disposal a considerable number of important intermediate products.

GAS-STOVE MAKERS AND MUNITION PRODUCTION.

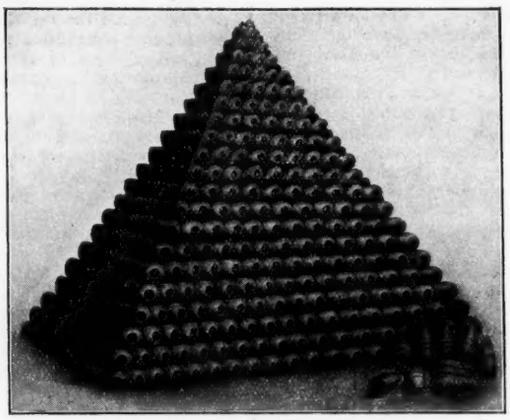
The Davis Gas-Stove Company "Under Government Control."

The valuable contribution made by the gas industry as a whole towards the overwhelming victory which it is hoped shortly to consummate by the conclusion of a just and enduring peace, has already received generous recognition in high quarters. In any case, it will need no elaboration in the "Journal," whose readers (almost without exception) have rendered their own individual quota of valuable war-time service.

We have, however, been placed in possession of a concise statement of facts and figures, augmented by a very interesting series of photographs, which demonstrate the intelligent adaptation to munition production of extensive resources expressly designed for, and previously devoted entirely to, the manufacture of gas-using appliances. The material mentioned represents also a degree of improvisation and development (under decidedly adverse conditions), as creditable to those under whose direction the work was carried out, as it must necessarily have proved useful in the national sense.

Our present reference—which is not intended to be, in fact is not, invidious to other concerns that have likewise given of their best—is to an important gas-stove manufacturing company whose main works at Luton, and auxiliary ones at Camberwell, came "under Government Control" early in 1915, when, as is now well known, the supply of munitions of war fell seriously short of military requirements, and when the services of all who could render efficient aid were anxiously requisitioned by a Government bent upon retrieving a position so critical that neglect of it must inevitably have led to national disaster.

From the moment when the Davis Gas-Stove Company came under the regulations effecting Government control, we believe its resources were unstintingly thrown into the balance against the enemy; and the following statement of the principal items of munitions dealt with from 1915 down to the signing of the armistice (representing well over three years of strenuous national service) may be cited as final upon the point:



A Stack of 112 lb. Aerial Bomb-Castings.

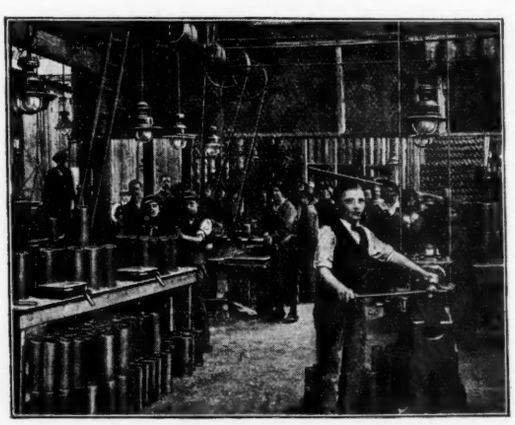
Those who are familiar with the types of machinery and the character of the personnel utilized in the manufacture of gas-stoves will be the first to appreciate all that must have been involved in adapting the one and the other to the production of an output so essentially dissimilar. For, while it may be true that certain processes are common to both peace production and war work of the kind here tabulated, no one versed in factory technique will deny that so formidable a conversion must necessarily have involved a vast amount of dislocation and disorganization; the imposition of enormous strain upon departments from which comparatively little might normally be called for; the utilization of machinery for purposes never contemplated when it was installed; extensive additions to plant hitherto found adequate; the investigation and practical mastery of entirely new metallurgical and other processes; and the creation of departments alien altogether to gas-stove making—such (for example) as that implied by the turning-out of over a million ammunition boxes to the exacting specifications of a Government department, by a company whose pre-war experience with boxes was confined to their use for packing purposes.

So formidable an industrial transformation would be of sufficient significance if carried out under the most favourable conditions that long years of peace could yield; but in this, as in many similar cases, the change was effected under circumstances aggravated by every difficulty.

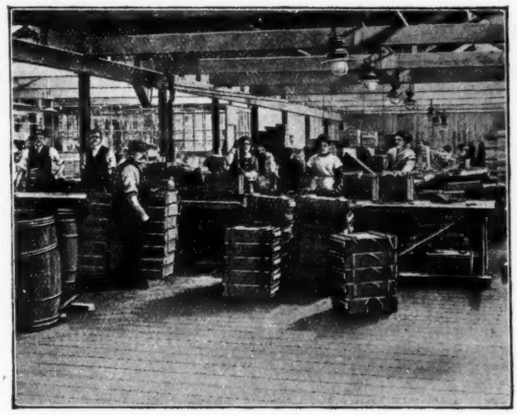
With a pay-roll of some 1500 employees (three-fourths males) the Company prior to the Government control were called upon to forego the services of hundreds of the employees as a result of voluntary enlistment on a scale evincing a high degree of individual patriotism; while further and continuous depletions took place through the operation of the Military Service Acts and the series of "comb-outs" resorted to from time to time as military necessity arose. The inconvenience thus involved will perhaps be best understood when it is stated that the cessation of fighting found the Company with approximately the same numerical pay-roll, but with the proportion of male and female labour reversed

Item.	Quantity Handled.
Hand-grenades and hand-grenade bodies	5,500,000
Aerial bomb-castings	55,000
Incendiary bomb-castings	20,000
18-pdr. ref. cartridge-cases	570,000
18-pdr. shrapnel fuse-sockets	2,500,000
Cast-iron fuses	900,000
Mine-castings	65,000
Base-plugs	9,500,000
Rifle-grenade dischargers	30,000
3-in. "Stokes" bombs	150,000
Stokes bomb-pistols	500,000
Blocks for 18-pdr. chemical shells	300,000
60-pdr. shrapnel heads	80,000
Cast-iron fuse-plugs	750,000
Large ammunition boxes	1,100,000
Electro-plating fuse parts	25,000,000
Furnaces for other munition factories	Large number.
Factory canteen equipment	Many installations.

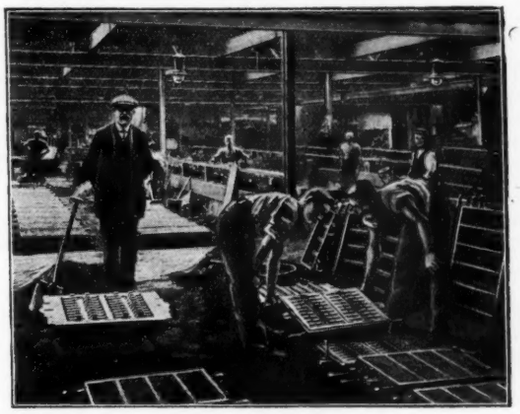
Shellacing Hand-Grenades.



Eighteen-Pounder Cartridge-Case Reforming Department.



Ammunition Box Making.



Moulding Pistol Castings.

as compared with 1914. The Company, however, pay high and well-deserved tribute to the versatility of the employees, and to the eagerness with which the dilutees, women and girls whom it became necessary to employ, assimilated the essentials of their respective tasks, and responded to the claims made upon their energy and assiduity.

Machine Piercing of Diaphragms of Ammunition Boxes.

It is also well known that, despite the excellent priority regulations in respect of raw materials, difficulties were constantly experienced even by firms engaged upon work of the highest national importance; and the Company whose activities are now being reviewed was no exception in respect of this important requirement of rapid mass production.

Last, but by no means least, the Company's resources were curtailed and their energies distracted by a disastrous works fire in the autumn of 1916, when many of the formidable initial difficulties of the change-over had been surmounted, and when the highest hopes were entertained as to the service that might thence-

Core Making for Two-inch Trench Bombs.

forward be rendered to the Government and the nation. The havoc wrought, while not allowed seriously to impede the good work embarked upon, proved to be a misfortune of considerable magnitude, in that the Company's warehouses and stores, which it was hoped to draw upon to maintain to a limited but adequate extent its normal gas-stove trade, were entirely gutted—involving the total loss of stocks absolutely irreplaceable during the throes of a great war.

To cite the foregoing difficulties, however, is but to emphasize the results achieved in spite of them; and if, as is frankly admitted, the Company's normal *clientèle* have suffered great inconveniences through the disabilities thereby imposed, even those who have the most reason to complain on this score will agree that national considerations should rightly take first place in a crisis such as that through which the British Empire has successfully passed.

Machining Hand-Grenades.

The Company must similarly be exonerated from all suspicion of financial *arrière pensée* in having placed their resources so early and so completely at the disposal of the Ministry—this for the conclusive reason that the profits for each and every year of "Government Control" were in fact less than the pre-war average. Yet to those who, on this account, may be minded to question the soundness of its war-time policy, the Company have an excellent

Machining Shell Parts of Various Kinds.

answer in the already historic conditions of the armistice, and all that may be expected to proceed, less perhaps from the terms themselves than from the implied power of the allies to impose their will upon a ruthless and insensate enemy, whose triumph would probably have rendered the lack or plenitude of gas-stoves a matter of very small moment indeed.

THE AMERICAN GAS ASSOCIATION.

From an American Correspondent.

Last summer your readers were told of the formation of the American Gas Association. Since then the new organization has been perfecting its staff as fast as war-time exigencies would permit. The four sections—Accounting, Commercial, Technical, and Manufacturers—have each chosen a Managing Committee to direct its energies; while many of the subjects of interest to each section have been assigned to specific committees for investigation and report at the annual meeting in October. In January the first issue of the "Monthly Bulletin" appeared.

To give the Association as a whole some opportunity of expressing an opinion on the plans for its activities, and to enable an interchange of views on the many problems confronting the gas industry in this post-war period, an informal conference was called for March 13 and 14 in New York City. The response was gratifying in the extreme, as the attendance exceeded 225, and included most of the leading men in the profession, with many from half-way across the Continent. Therefore, it was a large gathering facing the President (the Hon. George B. Cortelyou) at the opening session. The gathering convened first as an executive session, where company members only had the right to the floor or to vote. The business transacted was the election of a Committee to nominate officers for choice at the October meeting. The Committee being selected, the general session opened, and it was voted that the Association become an incorporated body.

Then the President read his address. He said that though "mankind is determined to measure results primarily by the yardstick of service and not of self-interest," yet "self-interest properly directed has ever been one of the guide-posts along the pathway to ordered liberty." They were out "to devise ways to make their Association" a source of helpfulness and inspiration to its members and to the public. He spoke of the whole-hearted manner in which the industry placed its facilities at the disposal of the Government during the war, of certain organization details, and of co-operation with the gas journals. In closing, he voiced his belief that "the greatest achievements of the gas industry are ahead of it." "My appeal to-day is for renewed energy and enterprise." "Who can measure the progress of the gas industry in the next decade, if vision and foresight shall be characteristic of its leaders of to-day?"

These thoughtful and thought-inspiring words from one who is a leader in our national life were received with great applause and ordered to be printed and sent to all members. The next item was a paper on the "Future Sales Policies of the Gas Industry and their Justification," by Mr. James P. Hanlan, the Chairman of the Sales Development Committee. He urged a price for appliances that would result in profit to the gas company, but contended for the inclusion of resultant gas sales as part of this profit. He wants closer co-operation between company and appliance manufacturer, and suggested that appliance costs might well be reduced by several gas companies combining when placing their orders. He thought that a wide field in room-heating was now available through the new type of fireplace heater. The paper advocated an aggressive campaign for the substitution of improved lighting units in place of the many existing inefficient designs. He considered the maintenance of appliances essential to proper service, and thought the labour cost might be recovered through the accompanying sale of merchandise.

In the discussion, various speakers expressed their belief that appliances could be marketed for profit. Where a note of warning was sounded to the effect that some classes of consumers might prove to be a source of loss, there was from several quarters the response that this could be avoided by a proper method of charging for gas, which included a consumer charge and a demand charge in addition to a charge for the gas used.

At the opening of the afternoon session, the President surprised the meeting by escorting to the platform the Hon. William C. Redfield, Secretary of Commerce in the Cabinet of President Wilson. Mr. Redfield's address was stirring in the extreme, and dwelt on the tremendous element of personal responsibility lodged with every individual controlling the actions of others. Inevitably the personality of the employer will be reflected in the employee; and as all democracics are in the last essential guided by the common man, the greater the field of influence of the employer, the more powerful for good or evil does he become. The Secretary received a round of applause, and a rising vote of thanks.

The Secretary's presence was possible owing to his attendance at a meeting of the National Industrial Conference Board being held in an adjoining room of the same hotel. He was followed by Mr. Magnus W. Alexander, the Managing-Director of the Board, who explained that it is an organization representing a number of national industries, and hoping in the end to comprise the entire field of American industry. It employs a staff of highly trained investigators, and has issued valuable pamphlets dealing with such subjects as workmen's compensation laws and hours of working. Your readers may find it hard to realize that, while Great Britain is subject to one compensation law, each of our 48 States has a law of its own; and even where one State has copied exactly the enactment of another, different judicial interpretation will result in difference in administration. It is to the interest of our holding companies who operate gas properties in different States to have all laws affecting them as uniform as possible; and one of the first steps towards securing uniformity is the knowledge of existing laws.

At the conclusion of Mr. Alexander's talk, President Cortelyou turned the meeting over to Mr. John B. Klumpp, the Chairman of the Technical Section. Mr. Klumpp spoke briefly of the work planned for the Technical Section, and said that most of it would be done by Committees, as he believed that in this way lay the achievement of results more valuable than those possible through individual effort. The following Committees are now at work: Carbonization, Cast-Iron Pipe-Joints, Cast-Iron Pipe Standards, Chemical, Consumers' Gas-Meters, Electrolysis, and Refractory Materials.

The Carbonization Committee stated that each member will submit a written report of any new development in carbonization that has come to his knowledge since the last report of a similar Committee of the late American Gas Institute. He will also make any suggestions that he may deem of value. The Cast-Iron Pipe Standards Committee invited communications from any member in regard to possible improvements in the present standards. The Electrolysis Committee explained that it was seeking information as detailed as possible of electrolytic damage to gas structures, and called attention to the seriousness of the general situation. The remaining Committees were instructed to submit reports of progress to date for publication in the Association "Monthly."

In presenting this Committee work, a little liberty has been taken to save space, as the three reports mentioned were not all presented at the afternoon session. On the conclusion of Mr. Klumpp's talk, Mr. G. I. Vincent read a brief paper on "Obtaining the Best Operating Results with the Inferior Quality of Raw Materials at Present being Received." Then followed "Wet Purification of Gas," by Mr. O. B. Evans. This was a short description of some results obtained in oil-refining in removing sulphur from an oil gas containing as high as 6000 grains per 100 c.ft. In the discussion, Mr. W. H. Fulweiler described the reduction in grains of fixed sulphur from 30 to 9 per 100 c.ft. of a coke-oven gas passed through precipitated iron oxide at a temperature of 450° Fahr. obtained by superheated steam. "What Shall We Do with Our Light-Oil Plants?" by Mr. W. H. Fulweiler, summarized the answers received to a questionnaire sent to companies who had been recovering toluol for war purposes. Under existing conditions in this country, there seems nothing to do except to dispose of the apparatus for what it will bring, as our supply of gasoline and the large production of benzol by bye-product coke-ovens deprives the average gas company of any opportunity to sell motor fuel. "The Disposal of Waste from Water-Gas Plants" was treated by Mr. R. B. Brown, solely with reference to ammonia still waste. He pointed out that the increasing practice of the chlorination of city water supplies renders absolutely necessary the complete elimination of certain impurities hitherto regarded as harmless. Of one impurity, one part in five hundred million will render chlorinated water undrinkable. Mr. Meston discussed the "Use of Electricity in Dehydrating Tar;" and the afternoon session closed with the presentation by Mr. E. C. Uhlig (the Chairman of the Chemical Committee) of a report on the "Value of the Chemist to the Gas Industry."

On Friday morning, a general session was held, with President Cortelyou in the chair. Mr. Edmund S. Dickey read a paper on "An Analysis of Present Market Conditions." He pleaded for more confidence on the part of all connected with the gas industry in going ahead at once. He said past experiences indicated that any recession on wages of labour would be very slow. Therefore existing prices would not alter materially, and it was unwise to delay needed purchases. "Development of Industrial Fuel Business," by Mr. W. A. Ehlers, was listened to with great interest. Mr. Ehlers is on the Association staff; and his services as a skilled industrial fuel engineer are available at cost to all member companies. He showed the tremendous extent of the fuel field, and the possibilities of capturing a large share for gas. It would be necessary among other things, to break down much prejudice, to enlist brains of the highest order in appliance design, to subordinate price to efficiency in choosing appliances, to determine performance standards, and to issue pamphlets for the education of those trades to which a gas fuel would be of service. He believes in placing the industrial fuel service of the Association at the disposal of any manufacturer. In the discussion, the extreme profitableness of the long-hour industrial business was pointed out; one speaker dilating on its vast proportions and stating that the reward of $1,000,000 to the inventor of any process of coal conversion to gas, efficient enough to displace coal as an industrial fuel, would be a negligible amount in comparison with the business obtained. A proper method of charging for gas was once more emphasized, with a further suggestion that the price per unit sold should vary with the cost of coal. One of the speakers was Mr. E. Russell Brayshaw, introduced as a manufacturer from England.

The last formal item was the discussion on the formation of an Advertising Section. The required fifty signers having been obtained to a petition to this effect, the subject was brought before the meeting, which voted unanimously for the new section. It will be a clearing-house for the advertising ideas of its members, and will place really attractive and efficient material at their disposal. In common with the other sections, it will have a paid and permanent staff. Prior to adjournment, President Cortelyou thanked the members for their part in the meeting, and congratulated them and the Association on the excellence of the papers and the accompanying discussions. He called for a few

remarks from some of the veterans of the industry. One of these speakers—Mr. Arthur Hewitt, of Toronto—touched on the note of service to the public that was characteristic of the meeting.

This first working of the Association has deepened the thankfulness in the gas industry that at last it is represented nationally by a single organization. The wisdom of the unification is expected to bear out the saying "Put all your eggs in one basket, and watch that basket." With the entire industry dependent on, and behind, the Association, it is bound to obtain results that were never possible when the only national organization was one dominated by engineers—or, in the later period, when the Institute and the Commercial Association tried to occupy the field together. Along this line it might be prophesied that, with aggressive leadership, your re-organized National Gas Council will later be the recognized spokesman of the British gas industry; the existing constituent Associations becoming sections of the main body, and as such specializing in the work belonging to their particular field.

MANUFACTURE OF GAS FROM WOOD AND PEAT.

Swiss Experience in Commercial Practice.

The shortage and the high price of coal which prevailed in many European countries during the war have evoked the publication by a number of gas makers of their experiences in the carbonization of other materials; but by none have the conditions been more comprehensively studied than by Dr. Ott, the Manager of the Zurich Gas-Works, and by him communicated to the Swiss Gas Association.

The problem of using wood or peat for gas making has been one of employing materials eminently unsuitable for the purpose; and if it were only a state of war which could impel gas makers to charge their retorts with these substitutes for coal, further reference to the technical difficulties might well be suppressed in an effort to forget the thousand-and-one evils of the war period. But inasmuch as other things than a world war may, unfortunately, disturb supplies of coal to countries which are dependent upon others, and as also gas makers in richly timbered parts of the world may prefer to employ what is at hand in the making of gas of a kind, an abridged translation of Dr. Ott's experience may be given.

The inherent drawback to the use of wood or peat in gas making is the high content of oxygen and the correspondingly low proportion of carbon—resulting in a large percentage of carbon dioxide in the gas and a consequent low calorific power. Thus the net calorific power per cubic metre of gas from wood or peat at 15° C. and 760 mm., and in the moist state, is from 3000 to 3700 calories, as against 4500 to 5000 calories for coal gas. The removal of the chief inert constituent, carbon dioxide, could raise this value to 4000 to 5000 calories; and, therefore, the first question examined has been that of preventing the formation of carbon dioxide or of removing it when formed.

Distillation at a high temperature will do something to lessen the proportion of carbon dioxide, by causing the formation of carbon monoxide by passing the carbon dioxide over carbon at a red heat. Theoretically, one volume of inert carbon dioxide should yield two volumes of carbon monoxide of 5660 calories. But even under experimental conditions, less than half the carbon dioxide is converted; while at the same time a large part of the heavy hydrocarbons is decomposed. The result is thus a gas of actually lower calorific power; in fact, an absolute as well as a relative loss of heat units is sustained. These results were obtained with gas freed from tar. Attempts to compensate for the decomposition of the heavy hydrocarbons, by causing the carbonization of the tarry vapours into gas and the formation of considerable quantities of water gas during the passage through a second retort connected to the first, proved of inconsiderable value. The net gain by this process, which has been tried on an industrial scale by the Gaswerke-Betriebs Gesellschaft, and by the firm of Rottenbach et Cie., has been found to be negligible. Another plan has been to distil the wood or peat in vertical or inclined retorts not more than half the space of which is filled. The carbon dioxide and tar then undergo partial decomposition without greatly endangering the heavy hydrocarbons. Tar which passes over can afterwards be utilized either by sprinkling the wood, coal, or (preferably) peat with it or else by distilling it separately. Such methods, while producing a slightly greater yield of gas, do nothing towards reducing its content of carbon dioxide.

The removal of the latter requires to be done in a subsequent process, the cheapest material for which is lime. Theoretically, 74 kilos. of lime should remove 24 cb.m. of carbon dioxide; but, in practice, more than 100 kilos. of dry slaked lime are required for this quantity of gas—partly because the material contains more water than corresponds with its formula, in addition to a certain proportion of carbonate of lime, and partly from the fact that its absorbent properties begin to fail when 75 p.ct. of it has done its work. The lime requires to be used dry. Though more efficient if used suspended in water, the production of 100 kilos. of chalk per 100 cb.m. of crude gas presents a problem in the way of mechanical agitation, in order to prevent any stoppage of the apparatus which could not be profitably solved. In any case, the cost of purification is high. A daily production of 20,000 cb.m. calls for 20 tonnes of slaked lime, costing 765 frs., or 275,000 frs. per annum, exclusive of labour. It is not, however, necessary to remove the whole of the carbon dioxide. With crude gas of 3400 calories, 15 p.ct. of carbon dioxide may be removed at the cost of 2·75c. per cb.m., so as to obtain a gas of 4000 calories.

The formula for the cost of the gas so produced may be stated as follows:

Cost of producing 1 cb.m. of crude gas of 3400 calories = a centime.

Cost of producing 0·85 cb.m. of gas of 4000 calories by the absorption of 0·15 cb.m. of carbon dioxide by means of 0·65 kilo. of lime = $a + 2{\cdot}5$ centimes.

Thus the cost of producing 1 cb.m. of gas of 4000 calories =

$$\frac{1}{0{\cdot}85}(a + 2{\cdot}5) = 176\,a + 2{\cdot}94 \text{ centimes.}$$

The gas containing its full proportion of carbon dioxide may be enriched with other gases or vapours. In view of the large production in Switzerland of calcium carbide, Dr. Ott discusses the use of acetylene for this purpose. While the plan is not in practice as simple as purification by lime, it is however practicable. The acetylene may, by means of injectors of a simple type, be mixed with the wood or peat gas before entering the customary purifiers. The gases mix perfectly in the purifiers where hydrogen sulphide and ammonia are retained, without any considerable loss of acetylene. A test having shown the proportion of acetylene required to bring the gas to a given calorific power, the volume can be gauged by weighing the carbide. A satisfactory mixture, obtained at the outlet of the gasholders calls for an addition of 5 cb.m. of acetylene to 100 cb.m. of the gas. Estimating the daily production of wood or peat gas in Switzerland at 100,000 cb.m., and the proportion of acetylene to be added as 5 p.ct., or 5000 cb.m., the daily demand for carbide would be 17 tonnes, or 6000 tonnes per annum. Although the Swiss production of carbide reaches 60,000 tonnes per annum, a great part of it is exported; and some difficulty would arise in obtaining the required quantity.

In converting gas of 3000 calories into that of 4000 calories by the addition of acetylene at 1·20 frs. per cb.m., the cost of materials is calculated as follows:

0·926 ob.m. of gas of 3400 calories requires 0·074 cb.m. of acetylene of 11,500 calories. Taking the cost of 1 cb.m. of 3400 calories gas as a centimes, the cost of 1 cb.m. of 4000 calories containing 7·4 p.ct. of acetylene will be $0{\cdot}926\,a + 8{\cdot}88$ centimes.

On the other hand, advantage may be taken of the mixture—consisting largely of lime—left in the acetylene generators, for the removal of carbon dioxide from the gas, though special means require to be taken to avoid the formation of blocking incrustations of carbonated lime. A kilo. of carbide, will yield about a kilo. of slaked lime and 300 metres of acetylene. Each 0·074 cb.m. of acetylene will correspond to 0·25 kilo. of slaked lime serving for the removal of 0·56 cb.m. of carbon dioxide. By this means, the calorific power may be increased to 4240 calories, or the use of the lime applied to reducing the quantity of acetylene required to make a gas of 4000 calories. The combined use of 0·074 cb.m. of acetylene and of the lime produced in its generation yielding an increase of 840 calories, the improvement of the gas from 3400 to 4000 calories in the same way will call for only 0·053 cb.m. of acetylene per 0·947 cb.m. of gas. The acetylene raises the calorific power to 3830 calories; and the absorption of the carbon dioxide completes the increase.

The relative economy of raising the calorific power by the above-mentioned methods may be compared by assuming a cost of the crude gas of 15 c. per cb.m. On this basis, the difference between the cost of a cubic metre of 3400 calorie gas and one of 4000 calories will be: 5·58 c. with lime alone; 7·77 c. with acetylene alone; and 6·41 c. with acetylene and the lime produced in its manufacture. In practice, the third method possesses certain advantages over the other two.

Although the quantity of condensation products is about the same from both wood and peat, their composition is very different. As wood contains little nitrogen, very little ammonia is formed; so that acetic acid is produced in considerable quantity (up to 1 p.ct.), and renders the condensation products acid. The production of acid varies according to circumstances. Woods such as firs give less than those from leafy trees. With well-dried wood, small charges, and a high temperature of distillation, the quantity of acetic acid may (although very rarely) be so reduced that the ammonia predominates, and renders the condensed liquors alkaline. It should be noted that a low content of water in the wood which is distilled favours a higher temperature of distillation, and thus the production of less acid. The latter is, of course, a very harmful constituent of the condensation products, since it attacks the conduits and other apparatus the materials of which are not copper and wood, as in the installations specially made for the distillation of wood. It is for this reason that the best results are obtained with a full temperature of the retort, and by charging them to not more than one-half of their capacity. The acetic acid thus undergoes decomposition in passing over a layer of incandescent carbon.

On the other hand, peat produces from 0·4 to 0·5 p.ct. of ammonia; and for this reason, and also because it yields less acetic acid, the condensation product has an alkaline reaction. Thus while peat, from this point of view, may be distilled like coal, special measures require to be taken to avoid the action of

acetic acid produced in distilling wood. This may be done by neutralization with ammonia—best in the hydraulic main; and the process may be assisted by distilling along with the wood fuels such as peat, lignite, or coals which give ammonia and may produce sufficient of it to give the condensed liquor an alkaline reaction. The acid may also be neutralized by other means—for example, by chalk contained in a vessel placed immediately behind the hydraulic main. But the tar requires to be first removed; otherwise there will be formed injurious deposits when absorbing the acetic acid. For this reason, a preferable method is to use washers charged with a chalk-mud. Or a still simpler and not too expensive plan, since the proportion of acid is very small, is to use alum waste residue in the hydraulic main.

The tars produced from wood and peat are very awkward materials to handle, owing to their great capacity for absorbing water up to such large proportions as 30 to 50 p.ct., without exhibiting any visible change. The water cannot be separated by subsidence, and is difficult to remove by centrifugal means. Thus the tars are of very low calorific power, and present great difficulties in distillation. Their distillates are poor in both benzol and toluol, but contain larger proportions of phenols. On these various accounts, the process of carbonization should be directed to produce as great a decomposition as possible of the tars by the employment of high-temperature distillation, small and dry charges, and exposure to a layer of incandescent carbon. In this way, the tar can be reduced to from 1 to 2 p.ct.

The solid residues left in the distillation of wood and peat likewise differ not so much in quantity as in their composition and appearance. Wood, owing to its low content of ash, yields a charcoal which likewise is low in ash—averaging from 2 to 6 p.ct. Peat, on the other hand, gives rise to a coke which may contain anything from 6 to 50 p.ct. of ash; and, unlike that from wood, it is structureless and powderless. Both cokes possess the objectionable property of absorbing as much as 30 p.ct. of water, and therefore require to be quenched with a good deal of care—preferably not with water but in a well-made receptacle by the exclusion of air.

SOCIETY OF CHEMICAL INDUSTRY.

Chemical Engineering Group.

At the Inaugural Meeting of the Chemical Engineering Group of the Society of Chemical Industry, held last month at the Liverpool Street Hotel, E.C., Mr. H. Talbot (the Hon. Secretary) said the Finance, Bureau of Information, and Stardardization Committees had already been formed. Arrangements for the first conference of the group to be held during the week of the annual general meeting of the Society in July were practically completed. Requests for the holding of other conferences had been received from various provincial centres; and arrangements would be made whenever possible. It was expected that the Council of the Society would make an annual grant which would largely defray the cost of these conferences. Assistance to the group funds had been received from various people; and it was hoped that further help of this kind would be forthcoming to enable the full programme to be carried out.

The draft rules were adopted by the meeting; and the first Committee of the Chemical Engineering Group was thereupon elected.

Prof. J. W. Hinchley (the Chairman) said that a number of papers had already been promised for the first conference; and he believed they would create a great deal of interest. So far as the group was concerned generally, there would ultimately have to be a qualifying body to deal with applications for membership; but at present membership was open to everybody interested in chemical engineering.

The meeting was followed by an Inaugural Dinner, at which Prof. H. Louis (President of the Society) was in the chair. Among the guests were Sir Alfred Keogh and Mr. D. Milne Watson.

Mr. Milne Watson (replying to the toast of "Our Guests") said that, speaking for the gas industry, they believed one reason why they could face the future with all the equanimity which was possible in these times of trouble and stress, was that they were a great chemical producing industry. The future of the gas industry lay very largely on the chemical side; and it had been brought home to the industry that they must get rid of their somewhat primitive methods of doing things. Gas was essentially a chemical product; and he for one, speaking for the gas industry, believed they must in the future get as much as possible into association with scientific bodies. It was not enough merely to have scientific men on their staffs. That was all to the good; but if great industrial businesses like the gas industry were going to be successful, they must ally themselves to scientific bodies like the Society of Chemical Industry and the Chemical Engineering Group, and cultivate a very close relationship with them. It was impossible for scientific men on the staffs of gas companies to keep themselves absolutely *au fait* with all that was going on in the great world of science; and therefore it was necessary for the industry to associate itself with scientific bodies. He was very pleased to be there to bear testimony to how much the gas industry appreciated what the chemical industry had done for them in the past; and, looking forward to the future, he believed they would have still more to thank them for.

COKE-OVEN MANAGERS' ASSOCIATION.

MIDLAND SECTION.

The following is a report of the discussion upon the address [*ante*, pp. 28-9] which Mr. D. V. Hollingworth, F.I.C., F.C.S., of Birchenwood, delivered at a meeting of the Midland Section of the Association held in Doncaster last Saturday week.

The Chairman (Mr. J. A. Wilson) said that coke-ovens, first and foremost, were put down for the production of metallurgical coke. The use of the gas for power depended largely on the demands for coke. He thought there was a tendency to exaggerate the amount of surplus gas which there was in coking plants. In some cases, where coke-oven plants had been able to supply a great deal of gas to towns, it had been where they had not had to raise their own steam heat. They all recognized the fact that there was great waste of efficiency in the burning of coal under boilers. With regard to the question of stocking coal, of course, they all knew what it was to have to use coal which had been weathered even for a few weeks; and their experience generally had not been very happy in this respect. Stocking coking coal for any length of time was very detrimental to its coking properties. With regard to the quality of the gas, it was largely a matter of suction, as on gas-works themselves. There had not been the occasion hitherto, on most plants, for watching this side most carefully. At his own plant at Staveley, when they had watched the suction they had run about 3 to 5 p.ct., and he did not think that many gas-works did much better than this.

Mr. B. Wilson Haigh (Barnsley) said Mr. Hollingworth had summarized in a splendid way the possibilities before coke-oven gas for illuminating purposes. While he had dwelt on many points, there were one or two on which he had not touched. The first point he had mentioned was with regard to purification. He had seemed to suggest that it was taken for granted that the purification would be done on the coking plant, and the gas delivered to the gas-works purified. Was this necessary when every gas-works at present had its own purification plant? It would mean extra capital cost to coke-oven people, and a great deal of extra trouble and responsibility, which he hardly thought was necessary. Another remark dealt with the crushing of electrical competition. He did not altogether like this phase. They were all out for the best for the national interests; and they must agree that the best medium for household lighting, at any rate, was electricity. It was the cleanest illuminating agent; and if their coke-oven gas could be in some way used in making power for electric lighting, he thought they would have a better result than in using it for lighting by gas. In regard to the enrichment of the gas, he understood Mr. Hollingworth to say that he did so by benzolized creosote. Perhaps he would enlarge as to what exactly he meant by this. The sliding-scale system of charging certainly seemed to be the best. There was one aspect of the question on which Mr. Hollingworth had not touched—that was, where facilities might not be possible for supplying a town, or the town might not want to take the gas, there were many industrial works—such, for instance, as glass works—where heat, and best of all heat in the shape of gas, could be very economically used. Many works of this kind had producers working on their premises for making their producer gas. There was a very profitable future in coking plants supplying such works, which could take smaller quantities, and suitable arrangements could be made without too much parliamentary power having to be obtained.

Mr. Geo. Chrisp (Silverwood) said the President had indicated a line of discussion to the meeting—rather an unusual course, and one to which he could hardly agree, because he did not see why the coke-oven managers should hold out a feeding bottle to the gas engineers. In pointing out the benefit of coke-oven gas to gas authorities, they would be starting at the wrong end. The proper place to start must be in a radical change in the heating of their own ovens before they would have much gas to dispose of. They required 60 to 80 p.ct. of their make for their own use in heating their ovens, and they were liable to very great fluctuations, due to breakdown, strikes, and moisture in the coal. Until they could be to some extent independent of the gas they produced in respect of the heating of the ovens, it would be very dangerous to instal much plant for the supply of town gas. On most of the collieries there was a giant tip, where there was enormous material for use for the purposes suggested. They had thousands of tons of waste matter, containing anything up to 40 p.ct. of combustible matter; and they might well point out to the colliery and coke-oven owners that this waste material was very valuable, and could be profitably used in producers. It would provide bye-products, and would avoid burning tips; and all the gas made in the ovens in this way could be available for town supply. Development in this direction would be the right course to take. Unlike gas-works, the coke-oven plants had no great reserve of gas to help to tide-over little periods of variation in the amount of gas coming forward. It was necessary that they should have as little fluctuation as possible in the heating arrangements, so as to ensure a continuous supply of gas and constant pressure and quality; and while they were so dependent upon the colliery with which they might be connected, they could not very well guarantee a constant supply of a constant quality. There was no reason why they should remain in this state. Gas-works held considerable stocks of coal, whereas if there was a breakdown in the colliery, the coke-ovens might not be able to get their own supply; and the coking manager who tried to supply a town with gas would be in a very serious position. Some years ago he had been concerned in a coking plant which supplied the neighbouring village with gas; and he could assure the meeting that on a good many occasions he had had to wait on the works till dark, and then sneak home by a roundabout route to avoid the aggrieved people. [Laughter.]

Mr. Haigh asked what was the usual reserve of gas held by a gas-works.

Mr. Hollingworth said there was no standard figure; but frequently not more than 24 hours' supply—possibly 36 hours.

Mr. C. P. Finn (Hemsworth) said in regard to the utilization of surplus gas, they could safely say that there could be greater economy

on their plants. In regard to the firing of boilers by gas, it was well known that this was not an economical proposition—that was not to say, that better methods of utilizing gas in firing boilers could not be effected. If they could exercise economy in the use of surplus gas, it followed that they had a greater surplus as a result; and they would have to look round for means of disposing of this surplus. If their own needs were supplied, but their surplus was not sufficient to supply the great electrical undertakings, they naturally looked to the local authority to take it. It was in this way that he thought the Government Commission had not acted fairly by the industry. He was not against electricity—far from it. But they all knew that gas was a very useful thing in a house; and if they could supply gas in a house at a low price they were doing a great national service. The Government had shown no encouragement for the erection of super-gas distributing stations, such as the electrical scheme now before the country. Personally, he knew a district of about 50,000 inhabitants where there were four or five small gas authorities supplying the area; and in each case the coal had to be carted by road from a colliery to the works. In the same area there were three large coking plants, with an aggregate of just over 200 ovens. Surely there would be enough surplus gas from these plants to satisfy the demands of that community. A more glaring instance of the lack of co-ordination on the part of local authorities existed in another district a little further away, where there were four towns of considerable size. In two of them there were two gas concerns whose mains almost ran into one another. In another of the towns, after many years, the Corporation had, by borrowing money—another insane proposition—bought-out the company, which had sucked the works almost to the degree of a dry orange. The fourth town was in a somewhat similar situation. Close to these growing towns there were three large coking plants. It was the duty of the Local Government Board to point out to the local authorities that they should co-ordinate their interests to have a common gas supply.

Mr. J. W. LEE (Hasland) said the question which, to his mind, was not debateable and must be generally accepted, was that where there was any surplus gas the best use should be made of it. In some places it was impossible that it should be used for town purposes. On many plants all the surplus gas was already being employed on the works. There was not a large quantity of available surplus gas for general uses. Still there were times (if not during the whole period of 24 hours) when a certain amount of gas was available for other purposes. Possibly the reason that this had not been recognized generally had been the fact that coke-oven gas had not come up to the proper standard for the purposes suggested by Mr. Hollingworth. It had been rightly pointed out that the gas should be of constant composition, should be supplied at constant pressure, and should be free from injurious impurities. He was not quite so sure whether every coke-oven plant was prepared to guarantee that these absolutely necessary things could be given. The plants ought to make themselves prepared to do so. They were in a better position to-day than ever before; but they could only come to the standard when they recognized fully that the gas was one of their valuable bye-products. It was up to them to produce the gas in such a way that it would meet the proper requirements of the consumer. He was not so much concerned with the calorific value or illuminating value; but the gas must, first and foremost, have a constant composition. This could be done on all their coking plants if they were careful enough in their operations. Constancy of pressure was essential, because the gas was to be used in apparatus supplied to the public by the gas authorities. The gas should be set for one composition; and the consumer should be assured that the composition would be such that the apparatus installed in his house would work at the highest efficiency throughout. As to purity, the sulphur content of coke-oven gas was always better than that of gas-works gas.

Mr. H. WARD asked if the gas could be scrubbed for benzol and still supplied for town lighting?

Mr. W. GREEN said they had various instances of gas supply contracts being undertaken by coke-oven plants. A notable case, of course, was that of the town supply at Middlesbrough. From the works on which he was engaged, they hoped soon to be able to supply gas to the neighbourhood. With regard to the calorific value, there was no trouble in supplying a gas of the required standard of 500 B.Th.U. without employing the two-main principle, which had been largely adopted in America and on the Continent. With the recording instruments which they now had at work, it was seen that this gas could be easily obtained on coke-oven plants, at any rate in South Yorkshire. With regard to distribution, the gas-works which would distribute had already purifiers, and there was no reason why the coke-oven plants should not supply unpurified gas to their purifiers. As to benzolized creosote, this point had been made in some gas-works during the war where they had been washing gas for toluene only. They had abstracted toluene from the gas, and imparted benzene into the oil and thereby enriched it.

The CHAIRMAN remarked that there were yet only vague ideas as to the exact amount of gas which they required for their own coke-oven purposes. Their present method was in being. They had to deal with the situation; and it was a thing on which they had very little data. Before they knew what quantities of surplus gas would be available for sale, they must really know for certain the amount required for heating their own ovens.

Mr. HOLLINGWORTH, replying to the discussion, said his object in presuming to give a lead to the discussion had been for the sake of the results which might possibly accure to the industry from it. In mentioning that purification might probably take place at the coking plant, he had had regard to this becoming a source of considerable revenue in the future. Purification, of course, was one of the operations which was carried on at a profit. The whole costs of the operation were more than met by the return coming from the sulphur and, possibly, the cyanides in the oxide.

The CHAIRMAN: Does not that apply solely, or mainly, to war-time conditions?

Mr. HOLLINGWORTH replied in the negative. The cost which was put on gas for many years prior to the war could practically never be considered more than ½d. per 1000 c.ft. With respect to crushing electrical competition, his point was exactly the benefit of the community in general. He thought it had been overwhelmingly proved that, except in the one single instance of lighting—and only then in a certain well-defined way—gas was more economical in every respect, possibly by five up to ten times as against electricity. Superficially, it might seem that electric light was much better than gas in the house; but it was not by any means so sure when one looked at it deeply. Gas lighting was one of the most valuable means of purifying and ventilating a room that was known. In his own experience, he had noticed that it had always been made a great point that the decorations in a room electrically lighted would last so much longer than those lit by gas; but this did not say that the room was so healthy or so sweet to live in as by the use of gas. It was not. In mentioning the term benzolized creosote, this offered a ready means of supplying a gas good enough for all purposes by any coking plant having some surplus gas of any value at liberty. In regard to the suggestion of the direct distribution of the gas among the large industrial undertakings, the circumstances of the present day would not permit it. They must remember that gas companies had the monopoly of this possibility of supply. They had the only right to disturb the streets, and had all the means of distribution in their hands. It would not pay a coking plant to attempt to compete with a gas authority in distribution unless the works to be supplied were practically in the next field to the coking plant. He had the greatest sympathy with Mr. Chrisp's desire to see more fully utilized the vast waste tips, and he saw very clearly that in the future this would be a source of revenue to the colliery proprietors. Unfortunately, there were no means at present of treating any material containing anything like the proportion of mineral matter which Mr. Chrisp had mentioned. With reference to stocks of coal, he thought he had made it clear that the only barrier between the gas-works and a cessation of supply in times of strikes, &c., was the stock of coal. All he maintained was that the possibility of maintaining similar stocks was quite within the power of the colliery concerns. Mr. Finn had put before the meeting the huge loss of revenue which could be avoided by the coking industry, and the huge saving which could be effected by the gas supply authorities, in a better way than he (Mr. Hollingworth) could have done; and he hoped that what he had said would bear fruit to both industries. In regard to Mr. Lee's point as to the sulphur compounds, he strongly disapproved of the principle of washing the gas with benzolized creosote. He believed they could without it make the gas good enough for every purpose, and even then the sulphur compounds would be very much lower than the majority of gas-works were at present making.

Mr. LEE: You would supply stripped gas?

Mr. HOLLINGWORTH said he had evidently rather misunderstood Mr. Lee's point. They would not have to wash the gas in the ordinary way for benzol. In most cases where a lighting gas was supplied to the public, it was done by passing the gas in two streams—one of which was entirely used for heating, and was stripped to the utmost, and the other which was bye-passed to the scrubbers and treated in this way In his own works, which had been equipped with the object of supplying an illuminating gas, the whole plant was put down in duplicate, so that they could simply take off the richest gas from every oven, pass it through its own condenser and its own exhauster, through a tar-extractor and the ammonia scrubbers, and finally out, in which case they did without the necessity of scrubbing with oil. He hoped some good might accrue to the industry all round as a result of his remarks, and of the very interesting discussion.

Mr. J. W. LEE, in proposing a vote of thanks to Mr. Hollingworth, said it was up to the coke-oven managers to see that the matter he had mentioned should be put into actual practice as far as possible. As to the question of the quantity of surplus gas on plants and the lack of data on the point, he said that on a battery of fifty regenerative ovens, which were working a Derbyshire coal, but suffering, like all others, from the strain of war conditions, there was about 800,000 to 850,000 c.ft. of gas actually metered per day. When the ovens were in anything like normal condition, he imagined the quantity could be increased to a million cubic feet.

Mr. G. T. PURVIS (Manvers Main), in seconding, remarked that some six years ago he had read a paper before the Institution of Gas Engineers on this subject; but on that occasion the idea was not received with much appreciation by the gas engineers. He strongly advocated that the heating of the ovens should be done entirely by low-grade coal, which could be made to give good gas for heating, though not for town lighting. Until all the gas which could be produced on coke-oven plants was utilized for lighting, or for something equally financially valuable, they were simply wasting gas. He was optimist enough to think, however, that the day of the waste-heat oven would be as short as that of the beehive oven. It would pay the industry to use the regenerative oven; and they would be able to do much in the way suggested by Mr. Hollingworth.

Mr. Hollingworth briefly thanked the members for the reception they had given to his paper.

At the next meeting of the Midland Section, to be held at Barnsley on the 26th inst., Mr. J. Thorpe will read a paper on "Some Features of Carbonization and Bye-Product Recovery."

Among recent wills proved is that of Mr. R. B. Main (Messrs. Glover and Main, Ltd.), who left property valued at £41,273.

The following were among the papers on the *agenda* for last night's meeting of the London Section of the Society of Chemical Industry: "The Estimation of Carbon Disulphide—A critical Examination of the Various Methods usually Employed," by Dr. Percy F. Spielmann and Mr. F. Butler Jones, B.A.; "Estimation of Thiophene," by Dr. Spielmann and Dr. S. P. Schotz; and "Estimation of Free Carbon in Tar and Pitch," by Dr. Spielmann and Mr. Henry Wood.

SCOTTISH GAS MANAGERS.

Annual Informal Meeting and Conference.

The Thirty-Sixth Annual Meeting of Scottish Gas Managers—a gathering which is largely suggestive of an informal conference—was held last Wednesday, in the Hall of the Royal Philosophical Society of Glasgow. The President, Mr. James Dickson, of Johnstone, occupied the chair; and the attendance was one of the most representative since 1914—fully 120 being present.

The Late Mr. Angus Mackenzie.

The Convener (Mr. J. W. Napier, of Alloa) said that, before proceeding with the business of the meeting, he was sure he merely echoed their wishes when he made reference to the loss which as an industry they had sustained through the death of Mr. Angus Mackenzie. Mr. Mackenzie had a personality all his own; and he was a gentleman whose interests were largely associated with the affairs of the members of the gas profession. Indeed, it might well be said of him that he watched the career of not a few among them from the cradle right up to the years of manhood. His vivacious manner was always pleasing; and, in point of fact, his personality had been altogether an outstanding one for many years past. He proposed that, in the name of the meeting, a resolution of sympathy and condolence should be forwarded to Mrs. Mackenzie and the family.

The President added a few words of sympathy; and the motion to forward a minute of condolence from the meeting was carried.

The Convener, having intimated a number of apologies for absence, called upon Mr. Dickson to deliver the following

PRESIDENTIAL ADDRESS.

The experiences of the past four years, which cover an ordinary lifetime of events, have familiarized us with many matters upon which we previously had but the haziest of notions. Our necessity has been the measure of our accomplishment. In our warfare with necessity, we have not ceased in our attempts to wrest from Nature anything she could yield that we might, as a nation, come once more into the light of freedom. At times we may have felt disheartened and almost overcome, yet the resolve to persevere brought us our victory. The young enthusiasm of the industry gave up its life, or its receptive and irresponsible years on the battlefront, and took on itself grave decisions that saved an Empire. We, at home, found day after day bringing forth new problems, and one now stands amazed at the nature and extent of the changes in ideas, methods, and processes that have established themselves in our industry.

Advance in Carbonization.

About August, 1914, we were looking forward to a development in the work of carbonization which marked one of the greatest advances in achievement on the part of the constructional gas engineer. We are only now emerging from a struggle which, though it has retarded further development in a purely constructional sense, has in various respects brought a change which perhaps otherwise would have required many years of fighting with prejudice and vested interest to overcome. Fuller development of the possibilities of carbonization of coal in vertical retorts required time; but time has brought the full import of these down upon us sooner than many expected or prepared for.

The outstanding feature of our progress as an industry during these years has lain in the endeavours that have been made to extract the last possible heat unit from the coal we carbonize. The steaming of vertical retorts, with the consequent dilution of straight coal gas with blue water gas, has marked a step in the conservation of the coal carbonized greater than anything accomplished since the introduction of regenerative firing. There were some who, in those days, saw no virtue in regeneration. We all think differently to-day. Yet, again, there are those who have difficulty in assessing the real balance of gain or loss between the supply of coal gas *per se* and its dilution with blue water gas followed by an increase in gas, tar, and ammonia, and a decrease in coke.

In the days of cheap coal, the first year of the war, it was not so incumbent on one who had to cater for a goodly proportion of flat-flame lighting to look with particular closeness and care into the economies of blue water-gas dilution. But as increase followed increase in the price of coal and all other commodities, this matter gradually forced itself upon attention to an extent that overshadowed all others. The gas engineer who can now look back upon those dark days during which he obtained a 30 p.ct. reduction in coal carbonized for the same gas output, a 20 p.ct. increase in sulphate of ammonia, from 20 to 25 p.ct. increase in tar, with the addition of a crude benzol production of 1½ gallons per ton—these bringing in their train a greater productive capacity per unit of plant employed, and consequently less wear and tear of running plant, with its collateral advantage of reduced labour—will be difficult to convince that what has been achieved is not all for the common good of the nation.

The productive capacity per retort has increased, as compared with past methods by 50 to 75 p.ct., taking average figures. This is not entirely due to water-gas dilution, as part of the gain must be attributed to the employment of higher temperatures. The old way of achieving higher yields was by cracking the hydrocarbons through longer duration periods of charge; then later by filling, or nearly filling, the horizontal retort and preserving the gas from the effects of radiant heat. In both cases an increased amount of gas per ton of coal was almost invariably accompanied by lower production per unit of retort power employed. To-day we obtain a greatly increased gas yield per ton of coal, with the inestimable advantage of a larger mouthpiece yield.

How far the economical extraction of gas and the secondary products from the coal may be carried within the next few years is outside the bounds of prophesy. Meantime, we seem to be on the verge of gas production of 18,000 to 20,000 c.ft. per ton of 400 to 420 B.Th.U. (should such a grade be considered an allowable standard to set up on the expiry of the present order); a sale of 5 to 6 cwt. of coke, after allowing for steam-raising for general works use, sulphate of ammonia manufacture, and oil recovery; a tar production of from 20 to 22 gallons; sulphate of ammonia from 35 to 40 lbs., with a crude benzol extract of from 1½ to 2¼ gallons per ton—these varying with the class of coal treated and its method of treatment. In Scotland, pre-war yields of 10,000 c.ft. of 550 B.Th.U. gas, coke from 9 to 10 cwt., tar 10 to 14 gallons, sulphate of ammonia 18 to 30 lbs.—the latter only occasional, and in a few places in the West of Scotland near specially suitable coal—with no benzol extraction, but, on the other hand, injection practised, might be accepted as representative figures.

Much will depend upon the local circumstances of each works in determining the economies of gasification of the surplus coke, with its 23½ million B.Th.U. content per ton, along with some further increase in ammonia products, if this can be achieved by externally applied heat and internal steam action. Coke is a necessity for many industries, and is not likely to be taken completely off the market—at least, in the immediate future. But all of us will remember times not so far distant when works after works could show huge stocks of coke lying exposed to the frost and snows of winter. Those days may come again; and it is well to be prepared by the knowledge and experience gained thus far, that heat can be supplied to the consumer in a handier and cleaner fashion than by means of coke which has been allowed to accumulate until, on removal, it leaves behind a high percentage of breeze and dust.

The Electrical Era and Fuel Equivalents.

On a previous occasion in our history as an industry, we were assailed with the threat of extinction. The electrical era has again come upon us; and its generation and distribution are promised support by the Government. It is certainly to be no light-hearted effort, comprehending as it does the improvement of the means of transport, and powers to transfer to the Ministry of Ways and Communications railways, trams, canals, and harbours. Justification for placing electricity under the control of the Ministry is found under the consideration that the railway companies are the largest individual users of electric current, that the railways afford the safest and cheapest routes for transmitting the current for the supply of towns and villages in the neighbourhood of generating stations, and that the electrification of railways offers the best prospect of affording the public cheaper travelling facilities. The electrical industry itself does not seem enamoured of the proposition, and to the gas industry it would hold out a prospect of powerful opposition, even of extinction, had not the gas engineer on this occasion also something with which to meet the threat.

The overwhelming efficiency of carbonizing methods as compared with the waste of burning good bituminous coal on an open grate and sending hourly into the open atmosphere vast amounts of valuable fertilizers for the soil, oils which may be used for thousands of useful purposes, compounds suitable for making colours of all shades, never again to be recovered but as soot and ashes, points the way to a need for the regeneration of electrical energy before it can fulfil completely the means of driving the wheels of industry and lighting and heating our homes. A concentration of power will be followed by concentration of trouble; and dislocation at the super-station will consequently be felt over a much wider area than in the case of more decentralized generation than seems meantime to be in the minds of the promoters. In the City of Glasgow, we had an instance lately of what might happen over a much wider area through a strike of boilermen throwing the electric supply out of commission within a few minutes. To the ordinary man, it does appear that the scheme places this weapon—of throwing a great district of industrial activity into darkness and idleness—more firmly than ever into the hands of undisciplined labour elements. The generation of electricity by the conversion of coal to steam power, and again converting this into another form of energy, losing in thermal efficiency all along the line, is a way of doing things which the gas engineer has avoided; and if the days of super-stations arrive, this individual will prove of service to the electrical industry.

At a time of national stress, in an endeavour to conserve the coal measures of the country, the Fuel and Lighting Order was drafted, and set down the equivalent of 15,000 c.ft. of gas as being,

for the purposes of the Order, 800 B.T.U. of electricity. About the same time, it was found that the average coal consumption per unit of electricity generated over the whole country ranged from 2·48 lbs. to 16·92 lbs. Taking an average of 5 lbs. (even though it favours electricity on the above figures) it is found that the gas undertaking selling 15,000 c.ft. of 450 B.Th.U. gas per ton will provide for 5 lbs. of carbonized fuel 33·5 c.ft. of gas, with an aggregate heat value of 15,075 B.Th.U., against the Board of Trade unit of electricity of heating value equivalent to 3320 B.Th.U., and yet conserve in the process 70 p.ct. of the original value of the fuel, whereas in the latter case it is destroyed. From a selling point of view, with gas at 2s. 6d. per 1000 c.ft., the 33¼ c.ft. will cost about 1d.; and the total available heat supply, for the same money, is five times that of electricity. Looking into known rates for electric current throughout the country, it is evident how far the Household Fuel and Lighting Order advantages the sale of electricity, when, for lighting purposes, 800 units of electricity allowed per ton of fuel at (say) 3½d. per unit, brings an income of £11 13s. 4d., as against 15,000 c.ft. of gas at (say) 3s. per 1000 c.ft., totalling £2 5s., to the respective undertakings.

Yet there is no indication of a larger equivalent being allowed gas consumers, other than that there would now seem to be a glint of hope resulting from the recent appeals various managers of gas undertakings have sent the Coal Mines Department, and which have drawn the reply that, if assurance can be given that present stocks and supplies of coal are likely to meet requirements, the matter will be considered. In other words, gas undertakings that save 20 to 30 p.ct. of coal, and are prepared to meet demands equal to the winter of 1917-18, are at present faced with prospective loss of sales in some cases as high as 10 p.ct., entirely due to the operation of the Household Fuel and Lighting Order, and are still waiting someone who will truly interpret the meaning of "conservation of fuel." There is no common-sense or justice in the present arrangement; and with all the talk about economy of coal and the value of the bye-products, the gas industry is being treated in a manner that is not encouraging. This, it will be agreed, is a very moderate statement of the position.

GRADE OF GAS AND VALUE TO THE CONSUMER.

The total extinction of the open grate, with its 20 p.ct. efficiency, and the substitution therefor of gaseous fuel with 70 p.ct. of the total-heat value of the fuel delivered to the room, is not an achievement that can be undertaken by means of the distribution of a 550 B.Th.U. gas. In the sale of a maximum content of 450 B.Th.U., there seems to me to lie the kernel of an ever-expanding business for us as useful members of the communities in which we move. Much research work is being undertaken to-day by the scientific men of the industry in order to determine the gas that will give the best results to the consumer, regard being had to the time taken to accomplish the work, the quantity of gas used, and the price per 1000 c.ft. at which it can be sold. Much, also, has been written on the subject of grades of gas before the war determined the supply of a heating gas stripped of its benzene as being the one essential grade to send out. Those at the head of our industry are still somewhat at variance, though perhaps the sponsors of 520 B.Th.U. made in horizontal retorts would not care to speak authoritatively for others supplying an oil-washed gas made in vertical retorts and delivered to the holders at from 7d. to 10d. per 1000 c.ft., and sold to consumers at from 2s. 6d. to 3s. per 1000 c.ft.

The suggestion has been made that a charge for gas based on heat, rather than volume, supplied would be the fairest way in which the consumer may determine what he is actually paying for; and if the means of arriving at this consummation were set up, it would go some considerable distance towards settling opinions in the councils of the industry as to the value of heat units delivered for a penny. Our sister industry would, as a matter of simple justice, have to be brought into line. In buying coal, we base our ideas of value on a definite volume of a certain grade of heat gas, the amount and nature of the residual coke, ammonia, tar, and oil. Although the electrical industry buys coal on a calorific basis, perhaps it may not altogether offer so pleasing a prospect to sell current on this basis. In any case, the matter seems worthy of all the attention that can be bestowed upon it, as it would seem that it will advantage more than anything the gas manager when called upon to meet competition from either raw coal or other forms of heat energy.

BENZOL—IN OR OUT.

Opinions are divided as to the future supply of benzol from gas-works. Some undertakings would seem to feel it a duty to now supply benzene in the gaseous form; while others who expended money in oil-washing and recovery plant during the war, and when the price of benzol was controlled, do not feel justified in advising the stoppage of operations in face of the urgent appeals for a home fuel for internal combustion engines. It has been put forward also that the conditions affecting the distribution of a 450 B.Th.U. oil-washed gas are against its continued production. For my part, I quite fail to understand this. The revolutionary changes through which the world is passing cannot fail in their effect upon such an every-day commodity as the gas with which we light and heat our homes. We have simply to go on with our educative work in the economical utilization of "Gas in the House;" and makers of appliances must assist in order to enable the consumption of this in the fire, cooker, or lighting burner to give better comparative efficiencies than our competitors can command. We are called on to give more service to the consumers; and this cannot be done otherwise than by economies effected in manufacture.

The sale of a refined benzol now offers an opportunity of reducing the net cost of coal. With municipal and statutory company undertakings, a share of the benefits accruing will come to the consumer, as the 5 p.ct. loss in heating value is considerably more than counterbalanced by the price per 1000 c.ft. at which the gas will be sold with benzol out of, rather than in, the gas. Attention is drawn to the recent appeal of the Automobile Association and its kindred societies, in which the possibility of many gas-works discontinuing the process of oil-washing was viewed with anxiety. Any reduction in the supply of benzol which gas-works were contributing was described as likely to be "disastrous;" and the opinion was expressed that even the smallest gas undertakings should receive "direct Government encouragement to scrub their gas for benzol." In view of the large and influential body of public opinion represented in such an Association, it must be to our advantage, and that of the nation, to help in the solution of the supply of an efficient home fuel for internal combustion engines. The whole subject of benzol extraction, if it is so urgent a matter for home needs, should be raised from the level of individual opinion and placed upon the higher plane of national duty.

MARKETS FOR SECONDARY PRODUCTS.

A more settled state of affairs in the industrial world would undoubtedly give an impetus to the markets open to the industry in secondary products. The value of tar to the producer in 1913-14 was round about 1¾d. to 2d. per gallon; and for three years thereafter it remained at from 1d. to 1½d. per gallon. For the present financial year, most undertakings will be averaging in a few cases 1½d., and the majority 1¼d. Mr. William Wilson, of Burton-on-Trent (then of Falkirk), in his capacity as President of the North British Association of Gas Managers, collected very full information as to the prices which producers were receiving in Scotland; and some remarkable divergencies were then exhibited. A Special Sub-Committee appointed by the old Scottish Gas Council has since held many meetings with the distillers, and after protracted discussion are, at the time of writing, nearing a final settlement, whereby the producer will share along with the distiller upon a sliding-scale of the net market prices attainable for pitch, pitch oil, and naphtha in the case of tar, and sulphate of ammonia in the case of ammoniacal liquor. An attempt has been made to arrive at an equitable basis of co-operative trading. The scheme, as drafted, binds the producer to a contract for five years and a break at the end of three, with a clause that, at the end of one year, he may give notice that he desires to terminate the contract and start the dehydration or distillation of tar. Such an arrangement was necessary if distillers were to have some assurance of supplies and a basis upon which to market products. Its proposals are worthy of support as a way out of the impossible position in which crude tar values are placed in Scotland.

The demand for tar for road-dressing during the next season will be very great; and the opening-out of the export markets, which have been at a standstill for four years, will show a continued increased demand. The needs of the home market must be kept in view, as this has been open to makers of refined tar to a very considerable extent throughout the war period, considering the extraordinary difficulties which road surveyors have had in the supply of labour and materials. Requirements for some years to come will be of an exceptional nature. Recent tests undertaken in Perthshire by the Road Board, co-operating with the Scottish District of the Institution of Municipal and County Engineers, have brought the tar macadam road into prominent relief at an important stage in the history of road construction. It was desired to provide data which would be of assistance to the authorities in deciding upon the best form of road to meet any given condition of traffic and weather. Three systems out of the many tested were termed "excellent," at the head of which stands tar macadam—*i.e.*, tarred material sealed with distilled tar. The other two mixtures were composed of macadam with different percentages of Mexican bituminous material. The respective costs of construction and maintenance per superficial yard were: For tar macadam, 22·80d.; for the others 26·20d. and 27·52d.

One cannot venture overfar into the region of prophecy in the sulphate of ammonia market. The instrumentality of the Sulphate of Ammonia Association in the fixing of a uniform delivered price of £18 10s. per ton on a 24½ p.ct. basis of ammonia as from June last, with the increases allowed for higher ammonia content than this, and the further allowances granted for the reduction in free acid, has brought the manufacturers of sulphate a better return than was possible during the previous three years, which gave utterly inadequate returns. Such export trade as was possible has been carried through by the Association under the equalization of export prices scheme in a way which has been equitable to all producers. It is to be hoped that, as a result of the low delivered price at which the farmer has been able to buy sulphate of ammonia at a time when other fertilizers were unobtainable at anything approaching this figure, he, on his part, will now have such knowledge of the virtues of the home product as will enable him to continue to extend its use in ever-increasing amounts. Interesting figures showing the consumption of the British farmer during the years of the war have lately been published. In 1913-14, the quantity per annum was 60,000 tons; in 1917-18, it had increased to 238,000 tons; and the demand for 1918-19 is estimated at 250,000 tons. The producing capacity of the United

Kingdom is estimated at 410,000 tons, calculated as sulphate of ammonia, and 50,000 tons in the form of concentrated liquor. This, in itself, appears hopeful; but the other side of the picture gives the producing capacity of the chief countries in the world as having risen from 1,154,500 tons in 1914 to 2,066,000 tons in 1918; and of these, Great Britain stands very low, with an increase of merely 7½ p.ct. alongside 120 p.ct. on the part of others. In the face of this, and keeping in mind the increase in synthetic nitrogen and the improved means of extraction of Chilean nitrate, it is apparent that the future can only be safeguarded by united effort on the part of producers; and it is well that the Sulphate of Ammonia Association are already in process of creating a selling organization (for home and export trade) which will help in the difficulties of storage and distribution, and will ultimately prevent makers being forced to sell-out at unremunerative prices.

DISTRIBUTION AND SALES.

After thus cursorily going over the field of gas manufacture as it presents itself to me to-day, there yet remains something to be said as to its distribution. It is, I am sure, our unanimous opinion that for heating purposes coal gas stands in an unrivalled position to-day, and in the power and lighting field it is capable of most excellent and very efficient service. Let us admit, also, that the adaptability and cleanliness of electricity for lighting places it in a favoured position, apart from mere cost of current and maintenance charges. The consumer who is able to sacrifice cost for convenience will mostly favour electricity. Speaking from my own experience of the past five years, during which the undertaking of which I am in charge has been called upon to meet electric competition in a district in which engineering works predominate, this has not been a matter of unusual concern to me. Although power consumers have been lost along with lighting consumers, the convenience of the gas-fire over the coal-fire has also enabled me to generally instal three to four fires in a house where electric light was being fitted. Convenience has thus had a double effect. In the interval, the output of gas from these works has increased by 35 p.ct.; and although a matter of 10 p.ct. of this was doubtless due to war conditions, to me there lies in this fact an indication of the line of policy that we must pursue in order not only to retain, but to increase, business.

With regard to power, where this is required intermittently the electric motor is often preferred, though costing more than gas, and is especially applicable to a factory with scattered machines and each required for a various number of hours per day. For long-hour drives, the modern gas-engine will leave the electric motor far in the rear in the matter of costs; but the undesirable feature in the case is that a modern electric motor, often enough, is compared with a gas-engine which has put in twenty years useful work. When this useful lifetime is expiring, all the persuasion one can bring to bear will not in some cases move buyers to give consideration to an up-to-date gas-engine. Considerations of space are put forward; and various arguments more or less substantial are advanced. But, as a matter of fact, electricity is being boomed as the last word on the subject of power drive; and this ends the matter with some. We have yet with us a clientele who take the trouble to look into every fact in the case before coming to a decision; and these are the customers whose business we must see to it we retain. Those of us who have experience of electricity in gas-works recognize its usefulness, while not overlooking its limitations. It fails at awkward moments; and a burn-out of an armature is a matter of not-infrequent happening. Spares must be plentiful; for they have the habit of being quickly eaten into. In short, maintenance charges are a very serious item altogether.

The sale of only the best incandescent burners will require to be undertaken by every municipal and company undertaking, so that electricity for lighting purposes cannot be compared with the most obsolete type of gas fitment. Maintenance staffs will require to be more generally adopted. The disappearance of women from the rougher tasks of gas-works labour would seem near at hand; but there is a wide field for a better class of workwomen visiting our consumers. Woman is at home in the house, and has a readier perception of requirements than man. In the work of cleaning burners, maintaining mantles, overhauling cookers, and re-adjusting gas-fires, I consider there is ample opportunity for woman's work that would result in a more satisfied public.

A time of overhaul lies in front of us; and the distributing will call for equal attention with the manufacturing system. Pressures on the trunk mains working outward from the works, and noting the drop as progress outward continues, must be undertaken. Gas made in horizontal retorts will be more likely to need such looking into than that made in vertical retorts. The naphthalene trouble has not, for well-known reasons, asserted itself with gas made in the latter; but it is rather certain that, with the former, the pressures in the distributing system must have varied greatly, and in some districts been totally inadequate. Even after good pressures are brought up to the consumers' meters, hampering effects are placed upon efficient lighting and heating by the consumption taken off the internal piping arrangements. Electricity has no such difficulty. That industry has seen from the development of our business how necessary it is to lay on ample service in order to supply present and extending needs. The problem of internal fittings in old houses is a serious one in the present state of matters between landlord and tenant; but the difficulties cannot be shirked by gas supply authorities, even though these should have to go much further into the domain of work of the private tradesman than they have hitherto dared to approach.

The maintenance of meters is a subject upon which each one has his own individual experiences; and the strenuous work of the past few years will not have permitted many undertakings to find sufficient leisure in which to compile comprehensive data showing the number of meters as compared with former years which are drawing lights, leaking at the diaphragms, or suffering from internal corrosion. Information on the subject would seem to be essential. All this cannot be undertaken at once; but a beginning requires to be made somewhere. The work of the distributing engineer can only be rendered lighter by the carbonizing engineer, both in regard to the constant pressure and quality of gas the latter gives him and the economies he may effect in the process. Allusion has already been made to this; and it cannot be too often repeated. Money requires to be obtained for the work, and can only be got by being saved or by being borrowed. It is quite impossible that it can be obtained by saving; but it is so much to the good if a proportion thereof is available. In the end, the Government must be made to realize the debt it owes to the gas industry, and as a return help it to carry on efficient service by providing capital for the expansion of its interests in the quieter paths of peace after the exhausting experiences it has undergone in the years of war.

THE NATIONAL GAS COUNCIL.

It is to the National Gas Council to whom we look for bringing the gas industry more prominently into the view of the parliamentarian. The industry is now organized on a more representative basis than it ever has been. The many professional associations in our midst have in the past carried comparatively little weight in bringing action to bear upon national questions affecting the welfare of the industry. An attempt was made in drafting the personnel of the old Scottish Gas Council to make it representative of the industry rather than of the profession. By equally dividing the chairmen or conveners of gas companies and municipal undertakings and gas engineers on the District Committee of the new National Gas Council, Scotland has done well; for it is to be regretted that, taken as a whole, the administrative and financial side of the industry has been somewhat overlooked. This will doubtless be remedied with experience. Meantime, our wholehearted support is due the Council. Its work will not be easy; and while criticism cannot be absent, let it be sympathetic, and of a kind that will be useful and constructive.

RESPONSIBILITIES AND STATUS OF THE GAS ENGINEER.

There has been a feeling in the ranks of the Council of the North British Association of Gas Managers during the past few years that something radical in its nature required to be done for the betterment of the status of the gas engineer, having regard to the responsibilities that fall to his care and the technical and commercial qualifications he must possess in order to fit him for his position. A report, prepared by a Sub-Committee, has been presented to the Council. Little need be said on the matter here, except that it is hoped it will bring prominently under the attention of gas committees or boards of directors what the gas engineer gives, and is prepared to give in the future, in order that they, on their part, may recognize what is fair remuneration for services rendered. A curriculum of a scheme of training is suggested, also an examination, with the Institution of Gas Engineers as the examining body, and a scale of salaries attached, which employers will be obliged to consider if they desire to get efficient service. In this way it is confidently expected that the status of the gas engineer may automatically improve, and that the industry will in future offer better inducements to the young men who must come forward to carry on the work of their predecessors.

CONCLUSION.

In spite of the clouds that lie over the industrial world, I am not going to conclude this address with a note of pessimism. The various conferences of industry that have sat during the past few weeks are aiming towards giving better conditions of life to the workers. It is to be hoped that solutions will be arrived at which will clear away some of the difficulties which darken the relations of employers and employed. If increased production, resulting in economies, does not follow the great concessions in the matter of hours and wages that have been made, then no industries can stand. Those in charge of industrial concerns feel the increasing and cumulative effects of the rise in costs. The National Conference of Industry may perhaps result in each set of workers looking from the other's viewpoint as well as his own, and coming down to a clearer knowledge of how far each can go before the fabric of industrial life is rent. Only in this way can some basis of partnership be set-up that will remove in-rooted ideas as to the remuneration due to thought, skill, enterprise, and risk, as distinct from the bodily labour of the common tasks.

At a time when the whole world is awaiting Peace, we, as gas engineers, have the recompense for our difficulties and worries of the years of war in that we have been able through it all to give wonderful service to the public under the extraordinary conditions that have prevailed. If from this it is possible to take our part in a new industrial life, with a greater feeling of trust permeating the ranks of employer and employed, the years indeed will have been well spent. Let us, at least, continue to do our part as directors of labour, however small our sphere may be, so that our industry may flourish and go forward to unthought-of adventures in the fields of useful enterprise.

Discussion.

The Convener said they were delighted to see with them their friend Mr. William Wilson, late of Falkirk, now of Burton-on-Trent; and they might well invite him to open the discussion.

Mr. W. Wilson (Burton-on-Trent) expressed his pleasure at being present, and said the address they had just listened to had been both thoughtful and able. There was not in it a great deal that could be described as of a controversial nature; but, even so, the address embodied many points of interest to the industry. The President was to be congratulated upon getting such high yields per retort. The general experience appeared to be that with steaming one did not get a larger yield per retort, but a very much larger yield per ton. Frankly, he quite agreed with the disposition on the part of those favoured few who had vertical retorts to make the most of them, especially at the present time, when the advantage was somewhat difficult to get. It could not be done with horizontals. There was no gainsaying the fact that they reached the limit there. His own experience was that, when the gas from horizontal retorts was below the 500 B.Th.U. standard, there was invariably trouble. Speaking for himself, he might say that he had manufactured gas from horizontals at 500 B.Th.U., and had had no trouble; but when it got down to (say) 480 B.Th.U., there were wholesale complaints. As to benzol, ought they to take it out or leave it in? So far as the financial aspect of the question was concerned, he came to the conclusion that the game was not worth the candle. The prices which were obtainable for crude benzol were not at all satisfactory. Very few of those among them were in a position to refine it, so as to make a decent motor spirit, for which they could command the regulation price. Those who sold the crude benzol, and had to pay the inflated price for wash-oil, were, to use an everyday expression, "up against it." After all, there was no very large profit in it—probably a fraction of a penny per 1000 c.ft. If, as against this, one was assailed with a host of complaints from consumers, then it was better to revert to the *status quo*. At a recent meeting of the Midland Association of Gas Engineers, a well-known expert on benzol extraction expressed himself in a similar strain—that "the game was not worth the candle." He believed it was quite a legitimate course to extract (say) half-a-gallon of benzol per ton of coal, particularly if it was desired at the same time to remove naphthalene. To his mind, this was a good method, if the intention was to get rid of the naphthalene troubles.

Tar Prices.

The President had very kindly mentioned his name in connection with tar prices. He had no doubt whatever that the whole business would soon be satisfactorily settled. On this point he would like to say that, in his opinion, the proposed scheme for Scotland was ahead of the English scheme, and, certainly, it was very much more workable. It appealed more particularly to the great majority of the works in Scotland—because these were small—which did not possess the necessary skilled and technical assistants capable of working-out into decimals the analyses, &c., for tar. The majority of the works in Scotland had neither the time nor the staff to enter into these elaborate details; and so they preferred to come to some amicable arrangement with the tar distillers. The latter could be treated in a spirit of mutual trust and friendliness; and it would be possible for both sides, because of the satisfactory arrangement, to say, "This is our bargain. We know you will stick to it; and we shall stick to it." In the course of the address by the President, he had observed a reference to old gas-engines. There was no doubt these poor old things had really caused them no end of worry. One thing, however, he had particularly noticed was that very few of these old engines would work with stripped gas. It was not uncommon to hear the owner of such an engine remarking—"It used to go with so much air before; now it goes with none at all." [Laughter.] How this sort of thing was managed, he (Mr. Wilson) could make a pretty shrewd guess. Mr. Dickson had ventured the remark that they ought in the very near future to enter further into the realms or the domains of the gas-fitter. In many instances, it was high time that something of this kind was done. Of late, it was quite possible that gas managers in Scotland might not have been paying the same amount of attention to the matter; but just prior to the war there was very severe competition among manufacturers, which narrowed itself down to a struggle as to who could put the cheapest gas-fittings on the market. Efficiency was sacrificed wholly for cheapness; and many of these types of fittings were a constant annoyance to the householder, besides constituting a danger to health, if it chanced that they were introduced into a small room. The time had now come when the gas industry ought to say, "We want the best thing possible in this line." He had come across a good many of the fittings, some of the worst of which were of German origin. Thank goodness, that was over and done with; but they ought now to appeal to their own countrymen to take this question seriously, and if they could provide proper fittings.

Horizontal v. Vertical Retorts.

Mr. Alexander Yuill (Dundee) congratulated the President on giving them an address teeming with scientific facts and truths regarding which there was no controverting. Reference had been made by the previous speaker to the old question of horizontal *v.* vertical retorts. Mr. Wilson had observed that, if he descended from 500 to 480 B.Th.U., he was sure to get complaints. This had not been his (Mr. Yuill's) experience. He found that no complaints were forthcoming if they went down even to 420. This point opened up another phase of the situation. Last year they manufactured gas in his works, for the Admiralty, from cannel coal. The fact remained, however, that while the percentage of illuminants in the gas was very high, he never had worse lighting in the town than during the period they were making gas from cannel coal. The mantles were blackened all over, and he could not get any proper incandescence from them. There seemed to be no question that the lighting by incandescent burners one got from vertical retort gas was to-day nothing like what it was in the old days. Flame temperature was a subject that required to be seriously considered; and he hoped that scientists would very soon go into this matter and give them the benefit of their deliberations. Mr. Wilson had referred to the expediency of investigating all complaints from consumers; and Mr. Dickson had spoken about training women to tackle a branch of this work. Prior to the war, he had three ladies, trained in cookery, who went about visiting the homes of consumers. They held diplomas in cookery; and the functions performed by them were rather to educate people in the proper way of cooking. He was quite at one with the President in recommending that properly qualified ladies should be appointed for the work suggested. They could visit the consumers periodically to see that the fittings were in order, and that the burners were satisfactory; and if anything was found deficient, a tradesman could be sent to perform the necessary repairs. They had now reached a time when they must attend to the interests of their consumers a great deal more than they had done in the past. In regard to high wages, he for one did not at all object to the payment of high wages. If they looked at this question from an economic point of view, they were bound to realize that they did not get the best out of any workman if they reduced him merely to the receipt of a bare living wage in return for his labour. Let them look at the two extremes. They had Russia on the one hand; and, of course, they knew that labour there was very cheap indeed. At the other end, they had America, where labour was paid at the rate of 20s. a day, and in some cases over that. Now America, notwithstanding the high rate of wages, was in a position to compete with every other country in the world. The explanation of this was primarily because America attained the very best out of her workmen. Over there the trades unions took up the sensible attitude of saying "We don't want to limit the capabilities or the powers of production of any of our men; but what we do insist upon is that each man must have a good living wage for an eight hours day to begin with."

The Grade and Value of Future Gas.

Mr. Laurence Hislop (Uddingston) said he had been much interested in the President's observations respecting the advance made in carbonization during the past three or four years. The late Mr. William Young, in his paper read before the North British Association in 1882, suggested that a yield of 50,000 c.ft. of powerfully heating gas could be obtained from a ton of Scotch coal, together with a yield of 1 cwt. of sulphate of ammonia. During the last few months, in Uddingston they had been successful in obtaining on various occasions (but for short periods only) a yield of over 50,000 c.ft. of stripped gas with 70 to 80 lbs. of sulphate of ammonia. But the difficulty of maintaining suitable temperatures, especially in the lower sections of the retorts, had prevented them from keeping up these results for more than a day or two at a time, which was not surprising, considering that the plant was designed to produce only straight coal gas of about 540 B.Th.U. The calorific power of the stripped gas, when making 50,000 to 60,000 c.ft. per ton, averaged over 350 B.Th.U.; and he thought the day was not far distant when they would be able to totally extract all the heat units from the coal and convert them into gas, as the makers of vertical retorts were now realizing the altered conditions of working, and were re-arranging the heating of their settings accordingly. To get total extraction of these heat units would require a longer retort heated to a greater temperature for the whole of its length. The coal would travel through this retort more slowly, which would enable the necessary quantity of steam to be efficiently used for the production of water gas and the extraction of the nitrogen as ammonia. The sweeping action of the larger volume of water gas would assist in driving-out quickly the volatile constituents of the coal, and prevent these valuable hydrocarbons from being broken-up, while at the same time the gas-making capacity of the retort would be increased. The retort could then be wrought under a slight pressure, which would ensure that no furnace gases, nitrogen, or other inerts could be drawn in. Their average make for the month of March had been fully 30,000 c.ft., with a sale of coke of a little over 6 cwt. per ton of coal carbonized. The average calorific value of this gas had been 400 B.Th.U. gross, and the average percentage of inerts under 12 p.ct. The average content of naphthalene in their gas during March was 1·2 grains per 100 c.ft.; while the average content of sulphur was under 7 grains. Even straight blue water gas could be produced more cheaply (and with a smaller percentage of inerts) in vertical retorts with external heating than in the best water-gas plant. With reference to the grade and value of the future gas supplied to the consumers, he emphasized the following points, as brought out by Mr. Cranfield in his lecture to the Scottish Juniors in 1914—viz.: (1) Constant quality and composition of gas, (2) smallest possible content of inerts, (3) low air/gas ratio to enable high flame temperatures to be obtained, (4) efficient pressure at the point of supply. It was much easier to keep a constant quality and composition when supplying gas of the lower grade; and this gas could be made and sold at a much less cost per B.Th.U. than the higher grade gas of pre-war days, even taking into account the present value of labour, coal, and other raw materials. A carefully manufactured gas of 380 to 400 B.Th.U. calorific value, with a low content of inerts, gave much greater efficiency to the consumers than many of the so-called high-grade gases which were at present being supplied, and which in many cases contained from 30 to 40 p.ct. of inerts. A much greater flame temperature could be obtained with the low-grade gas, owing to the better aëration and mixing in the injector tubes of the burners; while there was not the same tendency for the burners to light-back with this gas at low pressures as there was with the so-called high-grade gas. He had seen this low-grade gas tested on various occasions within the last few weeks, and giving splendid efficiency in an ordinary inverted burner at 6-10ths pressure. With reference to oil-washing for the extraction of benzol and other hydrocarbons, he considered that leaving the benzol in the gas caused more blackening of the mantles and deposit of soot in burner nozzles than anything else. The extraction and sale of benzol in liquid form as motor spirit, &c., was of more value to the undertaking in the way of reducing the net cost of coal and ultimately reducing the price of gas to the consumers. The extraction by oil-washing of one gallon of motor spirit only reduced the make per ton by about 100 c.ft., and the calorific value by about 3 p.ct.; while the present value of this gallon of motor spirit was about 2s. 6d. If a lower grade of gas was to be supplied in the future, it would be necessary for gas undertakings to employ an efficient maintenance staff to ensure that consumers used properly

adjusted gas appliances. In the course of the discussion that afternoon, Mr. Wilson had spoken about steaming not giving the same amount of gas per retort. It might interest the meeting to know that the makers' guarantee for the plant at the Uddingston Gas-Works was 35,000 c.ft. per retort per 24 hours. In actual practice, they had been able to secure an output of 90,000 c.ft. per retort for 24 hours. In reference to gas-engines, in the Uddingston Gas-Works they had two 40 H.P. "National" gas-engines, which were put in for driving an electric generator. It was interesting to note that they failed to find any difference in the working of these engines on the stripped gas of low calorific power than they did with the gas they were manufacturing in pre-war days. As Mr. Yuill also had mentioned, the incandescence of a mantle was certainly very much more brilliant with stripped low-grade gas than with the gas containing benzol. The many tests he had seen carried out lately had proved this point up to the hilt.

Fair Play for Electricity.

Mr. S. B. Langlands (Glasgow) said he was glad to see Mr. Hislop going so strongly forward in the splendid work he was doing. He recalled his experiment first of all for passing-back his liquor by hydraulic means. Then there were other useful things Mr. Hislop was doing many years ago when the rest of them associated with the gas industry in Scotland were quiescent. So far as the address was concerned, he thought the President was scarcely fair to the competitor of gas—electricity; and he could speak on this point as one having charge of both concerns. It was not quite fair to electricity to say "that the average coal consumption per unit of electricity generated over the whole country ranged from 2·48 lbs. to 16·92 lbs." For example, he supposed that Mr. Napier, of Alloa, who was present, could challenge the accuracy of these figures. He knew the Glasgow figure was about 3 lbs. just now, and it was hoped in the near future, with the opening of the new electricity works at Dalmarnock, to go even below this.

Mr. Dickson: I should explain that I was taking the average figures for Scotland.

Mr. Langlands: It seems to me that your case is strengthened by exactitude rather than by exaggeration.

Mr. Dickson: What do you particularly object to?

Mr. Langlands: I object to the highest figure merely.

Mr. Dickson: Do you think we should bring it down to the first-mentioned figure?

Mr. Langlands: It certainly gives you a better fighting basis.

Mr. Dickson: Well, we can fight our competitor on this figure too.

Mr. Langlands, proceeding with his general observations, said he was glad to hear Mr. Hislop emphasizing the need of consistency in the pressure of the gas as brought out in Mr. Cranfield's lecture. Consistency of pressure was needed above all things. The necessity for this was, he was afraid, sometimes forgotten by suppliers. Altogether, Mr. Dickson's was a carefully-reasoned address; and he considered it would form one of the standard papers in the future.

Effects of Benzol Extraction.

Mr. S. Milne (Aberdeen) said he had to join with the others in words of congratulation to the President. The discussion had been valuable in respect that it revealed from Mr. Hislop some remarkable figures in connection with the Uddingston Gas-Works. He congratulated Mr. Hislop on the results obtained; and he should not be the least surprised if, as a result of the investigations and experiments now being made, an order was issued calling upon them all to produce similar gas in the national interest. Mr. Wilson, in the course of his remarks, made reference to inflammable gas, which he supposed would be in contra-distinction to illuminating gas. However, he was old-fashioned enough to appreciate the fact that there was a degree of satisfaction in producing a gas that gave light. The plain truth of the matter was they had to put up with indifferent illumination because it had been found necessary to produce such things. In the course of the discussion a good deal had been said about the extraction of oils from the gas; and he thought he was right in saying that, since the extraction of benzol, there had been a considerable amount of trouble with meters. Personally, he had no experience of this, for the simple reason that he did not fully extract benzol from his gas. In some towns, however, where they had been extracting pretty freely, the leather of the diaphragms became hard and brittle, and caused leakage. In his own case, they had no trouble with the meters; but they had experienced some little annoyance with a deposit of oxide of iron. He was wondering if this had been a general experience; and he rather fancied that it would be. In Aberdeen, there had been trouble with naphthalene. There were many varying ideas and notions as to how to avoid this trouble. One suggestion freely offered was to thoroughly wash the gas, next extract the naphthalene, and then take out half-a-gallon of benzol per ton. In such circumstances it was urged one would be free from naphthalene trouble. It was worthy of note that since the armistice was signed they stopped oil-washing entirely. For the first week or two afterwards they had more trouble than ever with the naphthalene. Gradually it began to disappear; and now they had practically no difficulty at all. Lately they had heard about rich gas being diluted and sent out in this fashion from the works. It did seem to him that such a process would require considerable extra pressure or an increasing size of the trunk and distributing mains. Personally, he had been much interested in the statement of Mr. Hislop in which he gave some indication of the increased quantity of gas that was required to purify certain types for what was known as rich gas. He was quite convinced that all gas appliances—cookers as well as fires—should be fitted with adjustments.

Importance of the Lighting Branch.—Unit Basis of Charging.

He did not think the President had spoken in any glib fashion at all when he referred to gas for lighting purposes having to take second place to electricity. At the same time, he always had the feeling that, as managers, they spoke much too glibly about lighting. It seemed to him that if as an industry they could hold their own in respect of cooking, then the place they held in regard to lighting would not go. After all, lighting was the backbone of their business. It was true that most of them were doing a developing business so far as heating and cooking were concerned; but the singular thing was that if they took the trouble to inquire into the consumption and to analyze the details of it, they would be surprised to find that a large proportion of this consumption was still lighting. In the course of Mr. Dickson's address, he noticed a reference to the suggested method of charging for gas by unit. During the past few weeks, this was a particular idea which to some extent had been absorbing the attention of the Technical Press. Speaking for himself, he could say that he did not approve of the idea at all. As a means of setting-up a standard of comparison between one town and another, or one company and another, it might possess some virtue or advantage; but as a suggested basis of charging the consumer for the gas that had been consumed, he failed to see the effectiveness or force of the idea at all.

Status, Salaries, and Wages.

Mr. D. Fulton (Helensburgh) said that Mr. Dickson touched very lightly upon a subject that had been engaging the attention of the North British Association of Gas Managers for the past four months, and that was the status and remuneration of the gas engineer. A small Sub-Committee of the Council of the Association had gone very fully into the question; and they had realized most strongly that the time for individual action had gone. Frankly, he thought the greatest enemy of the gas profession in the past had been the individual who had showed himself willing to accept the post of manager at almost any salary. Then, throughout the country they found widespread ignorance of the qualifications that were required for a gas manager. The ideas that a roadman or the acquaintance of the bowling green were good enough in time and capable enough of becoming gas managers had not yet become eradicated. He hoped, therefore, that, when this subject was brought before the gas profession in Scotland, as it would very shortly now, the members of the industry would answer with one voice and say: "Yes, we are going to act henceforth in an united way." Reference had been made during the discussion to the subject of gas appliances. There was no doubt that in the past they had much too great a variety of these. Some of the appliances were well made; others were fairly well made; and others again were very indifferently made. It rather appeared to him they had been asleep in permitting these inferior appliances to be foisted upon householders who had to use the gas. No one had ever suggested that the electrical engineers permitted the all-round adoption of inferior motors and appliances. Why was that? It was a subject which demanded investigation. Was there not a suggestion in the President's address that the British Commercial Gas Association might be induced to take up this subject with advantage and profit? For example, Mr. Dickson referred to electricity being boomed for power purposes, and to the readiness with which people appeared to take for granted the representations of electrical agents. There was something wrong somewhere; and he suggested that the British Commercial Gas Association should go into the matter and see if the propaganda was at fault in any way. The President had brought forward several suggestions as to the standardization of high-grade appliances and fittings, and the superintendence of these from time to time by a staff of women specially trained for the purpose. He (Mr. Fulton) wondered, however, if he had gone into the cost that would be involved by the adoption of his ideas. So far as wages were concerned, he was glad to hear an authority like Mr. Yuill stating quite seriously that he did not at all favour the payment of low wages. He was glad to-day that, as a nation, they were committing themselves to the principle of higher wages, because there could be no greater spur to their manufacturers to improve their methods and adopt the American idea of scientific management. In the statement he had submitted to them, Mr. Laurence Hislop had admirably illustrated the points of difference between fairly high-grade gas and low-grade gas. The true criterion was the amount of gas that was usefully applied in the circumstances. It certainly seemed to him that, with the lower-grade gas, the possibilities of efficiency were very much greater.

A National Council Representative's Remarks.

Mr. Leggot, the Chairman of the Coatbridge Gas Company, and President of the Scottish District Executive Board of the National Gas Council, speaking on the invitation of the Convener, said there was only one point in the address he particularly desired to touch upon, and that was in relation to the competition between gas and electricity. He was one of those who had no fear for the future of the gas industry, always provided that it got some measure of fairplay. There was no reason why the Government should crack-up electricity as the one thing over-all and in-all for heating and, especially, for power purposes. Gas, if properly applied, would be quite as cheap and as efficient as electricity. Touching on the treatment that the gas industry had received from the Government, he could not make out why every other industry should be considered as deserving of from 8 to 10 p.ct. on its capital when 3 p.ct. was deemed sufficient for money invested in the gas industry. Seeing that a National Gas Council had been instituted on a solid basis, representing practically the whole of Britain—or at all events, 90 p.ct. of the towns in Britain—the Government ought to be immediately approached and told not that they ought, but that they really must, pay the gas industry on a proper footing. During the war the gas industry had been probably the most patriotic. Very often during the course of the war munition works had been supplied at cost price; and the position now was that the Government should be very plainly told that the gas industry could not permit its dividends to go down to a ridiculous minimum. In regard to the President's reference to the employment of women, undoubtedly they ought to be engaged for the inspection of apparatus and fittings in dwelling-houses, because housewives generally would welcome their own sex calling.

A Word of Praise for the "B.C.G.A."

Mr. John Wilson (Motherwell), as one of the junior members of the industry, did not quite agree with the suggestion that they were a little behind the times in respect of propaganda work. On the other hand, he rather thought the British Commercial Gas Association were to be congratulated on the results achieved. He knew that electrical engineers were a little envious of its propaganda work on behalf of the gas industry. The question had been raised that afternoon as to why

the Government should deal so largely in electrical undertakings and forget all about the subject of gas production. He thought one explanation of this was that the modern politician and the modern Government were very prone to give promises and to look far ahead into the region of the speculative and what-might-be. Like some of the preceding speakers, he quite endorsed the view that the industry ought not to give up lighting. If they were to retain their hold on lighting, then one of the first things that should be done was to scrap flat-flame burners. The divergence of opinion arising out of low-grade and high-grade gas had been well hit on the head by Mr. Wilson, of Burton-on-Trent. His views on this subject were eminently sound and sensible. He (the speaker) did not think it was right to say that America could claim increased output because of high wages; but he rather thought America could assert that she could pay high wages because of increased output. Frankly, he considered it would be an advantage to this country if it had to pay high wages, because everyone associated with industry would have to do better in order to meet them. On the question of meters, he had the confirmed feeling that the bulk of the troubles there were due to insufficient watching over the purifiers. If they paid greater attention to their oxygen content, there would be less rusting in appliances, and particularly in meters. Attention to these details would ensure that the meters lasted longer, and there would be no drying-up of the diaphragms. The trouble with meters was not so much due to oil-washing the gas as to inattention to the oxygen content.

Meter Leathers—A Maker's Views.

Mr. James Hutton (the Managing Director of Messrs. Alder and Mackay, Ltd.) said that the question raised with regard to the life of meters was one that had of late been seriously gone into by a Committee representative of gas engineers, meter makers, and scientific experts generally. The investigations and inquiries they had made had not, however, enabled the members of the Committee to reach any really definite conclusion as to what was the cause of the trouble. He might put the position in this way—that it was rather singular that meters taken from a particular area in a town showed quite different effects or results from those taken from another area in the same town. This was a position which it was somewhat difficult to understand. He supposed the phenomenon could not be fathomed unless special investigations were pursued by men of considerable science. This much could be said, however, that the gas-meter manufacturers were doing their very utmost to cope with the situation. The drying-up of the diaphragm leathers was the principal trouble, along with a deposit that often appeared in the prepayment valve of dry meters. A suggestion had been made that perhaps the diaphragm could be sprayed. It was not unlikely that the report of the Committee would in due course be published; and it was quite possible that, before the views of the Committee were made public, something practicable or feasible would be evolved which would considerably help in the elucidation of this question.

Meter Experiences at Perth.

Mr. David Vass (Perth) said that quite recently in his town one or two of the meters showed distinct traces of naphthalene deposit in the valves. When meters in this condition were detected in time, matters were not quite so bad; but if an interval elapsed, there was not the same opportunity of seeing what was the cause. In his district he had tried, and was continuing to try, an arrangement of spraying the valves. The spraying had cured quite a number of valves. In point of fact, other troubles which might have caused the meter to be taken down and overhauled had been got rid of in this way. The meters had not been cured in every case; but in quite a number of instances a cure had been effected. It seemed to him that one of their first duties as a Gas Association was to keep prominently before them the fact that the continuance of the Fuel Controller was likely to be detrimental to the industry as time went on. The position to-day was that if a local Fuel Overseer found that a consumer was using more gas than formerly, it was within his powers to send him a warning note. The Overseers in this way drove the consumer to be more economical. It should be placed before the Fuel Controller that gas was more economical than coal.

Reply by the President.

The President, in dealing with the points raised in the discussion, said he had not, he observed, been asked to answer many questions. It appeared necessary for him to at least substantiate some of the percentage figures he had given; and he would take the opportunity of doing so now. In the year 1913-14, for example, they used at Johnstone 9985 tons of coal; and the make of gas per ton came out at 10,113 c.ft.; coke, 7 cwt.; tar, 16 gallons; sulphate, 29 lbs. For the year 1918-19—that was, up to March 29—there were used 6642 tons of coal; and the make per ton represented 16,012 c.ft.; coke, 5¼ cwt.; tar, 20 gallons; sulphate, 35 lbs. These figures clearly bore out what he had put forward. Therefore, if he could make his claim good for his own works at Johnstone, surely he was legitimately entitled to tender a similar claim on behalf of the industry? He felt he was justified in making such a claim on behalf of the industry generally, so far as vertical retorts were concerned. Mr. Laurence Hislop had supplied them with full particulars respecting what had been done at Uddingston; but the details had not been any too full. Indeed, Mr. Hislop, had he been at liberty to speak more freely, could have stated a good deal more that might have been of considerable value to the industry. The members of the Commercial Section of the Gas Association who were at Uddingston some months ago must have had their eyes opened. A remark had been made that all flat-flame gas-burners ought to be scrapped; and on much the same subject, Mr. Milne, of Aberdeen, had stoutly maintained that their first duty was to sell gas that would give consumers a good light. He agreed that such ought to be their first duty in the immediate future; but he denied that this could be done with the flat-flame burner. There were certain points in Mr. Hislop's figures that he could not altogether reconcile, because his own experience had been that if he obtained more gas he got less coke. The results were marvellous and to some extent irreconcilable—unless, of course, Mr. Hislop was still holding something "up his sleeve." The explanation of it all might be that inferior fuel was brought in to the gas-works at Uddingston for steam-raising while the coke was kept for the market. Provided this was the solution, then it was indeed a satisfactory one; and it disclosed a business mind and business acumen. Mr. Langlands rather took exception to the figures he had given for electricity, and represented that a lower figure than 5 lbs. per kilowatt generated should have been taken. On this point, he (the President) felt he might fairly have taken higher figures. On the question, however, of comparative efficiency, he referred to the suggestive paper by Sir Dugald Clerk, on the efficiency of electricity as compared with the conservation of fuel by gas manufacture. No doubt those present would have read this valuable communication, and they would observe that it bore out what he (Mr. Dickson) had really been trying to get at. On the question of gas undertakings becoming responsible for the maintenance of gas burners, cookers, heaters, &c., he might admit to Mr. Fulton that he had not gone into the subject of cost at all.

The Convener said the President had dealt with subjects of interest to the gas industry in a legislative and scientific manner, and with the broad-minded outlook which belonged to the commercial mind. Personally, he was satisfied that whatever lay in the future for the gas industry, whatever its policy might be, it would not be dictated by any line of action at the instance of the manufacturer or by the demand of the consumer, but rather by the simple law of economics. The wealth of a country was usually measured by the extent of its industries; and to his mind the gas industry offered the greatest advantages for the conservation of fuel. He asked the meeting to award Mr. Dickson a cordial vote of thanks.

Next Year's Meeting.

The Convener said that time and the future might determine an amalgamation of the Associations in Scotland; but for the present the feeling was that they ought to continue these annual meetings, which had been carried on since the year 1884. The only remaining duty before them was to nominate a Chairman for next year's gathering. He had much pleasure in putting before the meeting the name of Mr. J. Smith, of Stirling.

The President seconded the motion, which was agreed to unanimously.

The proceedings were then brought to a close.

Chemistry in Modern Warfare.

A lengthy special article has appeared in the columns of the "Yorkshire Post," dealing with chemistry as a line of defence, and based upon an interview with Lieutenant-Colonel Smithells. It is remarked that a notable share in the devising of means of successfully combating the enemy's poison gas attacks has been borne by the University of Leeds; and to Prof. Arthur Smithells, F.R.S., the Head of the Chemistry Department in the University, was entrusted the duty of organizing and superintending home-training in anti-gas measures. A number of other members of the staff held special appointments; and many students of Leeds University Chemistry Department served in the special brigade of the Royal Engineers in charge of gas warfare and defence. Lieutenant-Colonel Smithells has been continuously occupied with this important branch of defence since the summer of 1915, when he was attached to the Northern Command as civilian lecturer on gas warfare. In this capacity, he visited the various training camps, and gave instruction and demonstrations to the troops until June, 1916, when he was appointed (with his present rank) Chief Chemical Adviser at the General Headquarters of the London Home Forces. At the time of his appointment, the training in anti-gas measures was done in France; and the first task was to take over the work and arrange for its completion as far as possible in this country. Subsequently, more than 3,000,000 men were trained and put through chlorine gas before going to the front. The enemies' attacks were constantly changing; and the defence had to keep pace with them. First of all there was cloud gas, then tear gas, mustard gas, sneezing gas; and each variety presented new problems. From an early stage in the operations, he declared, the British defence was undoubtedly superior to that of the enemy; and it remained so to the end. As to attack, Germany's great resources in point of the number (not quality) of chemists engaged, and the huge concerns connected with the German chemical industry, gave the enemy an advantage which it seemed hardly possible could be overcome within a reasonable term of years. Marvels were, however, he declared, accomplished—first of all, in working out scientific methods of manufacture; and, secondly, in transferring these to large-scale operations. So it was that our offensive soon became a terror to the German troops.

Gas-Fired Ovens for Malleable Iron.—In the course of a paper on the "Manufacture of Malleable Cast Iron," read before the Manchester Metallurgical Society, Mr. J. S. M'Craith said he knew of one firm, users of a number of large gas-fired ovens, who went back to the old small coal-fired ovens. The reason was, they said, that the flame was too rough and they got burned castings. The real difference between gas-fired and coal-fired ovens was, in his opinion, a matter of size. A speaker during the discussion agreed with the author on this point. It was, he remarked, a surprising thing to him that manufacturers should put down large furnaces before they had determined whether the question of temperature grading was essential in the process of manufacture.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

Annual General Meeting.

The Nineteenth Annual Meeting of the Association was held on Saturday, at the Grosvenor Hotel, Manchester. Mr. C. E. Teasdale (the retiring President) occupied the chair; and there was a good attendance.

The President gave a hearty welcome to the visitors—Messrs. T. Duxbury (Oldham), G. S. Frith (Secretary of the Manchester Institution of Gas Engineers), T. Fairhurst (Chairman of the Altrincham Gas Company), H. R. S. Williams (Engineer and Manager at Altrincham), H. Sissons (Partington Steel and Iron Company), and E. Loughton (President of the Yorkshire Junior Gas Association).

Annual Report.

Mr. J. Bridge presented the annual report of the Council; and it was adopted on the proposition of Mr. A. L. Holton, seconded by J. M'Nicholl.

This report of the Council for the twentieth session stated that on April 6, 1918, the number of members was 175; and since then nine have enrolled. One has ceased to be a member in accordance with Rule 4, one has been transferred to another Association, one has resigned, and three have died. This leaves the membership at 178—an increase of three.

At the Joint Council meeting of English Junior Gas Associations, held in Leeds on October 19, the following reslution was passed: "That this meeting of the appointed representatives of the English Junior Gas Associations desires to place on record its deep appreciation of the high value of the services rendered by Mr. A. L. Holton as the first Hon. Secretary of the Joint Council, which post he held from its inception in 1908 to 1917. To the efforts of Mr. Holton is due the co-ordination of the work of the English Junior Gas Associations; and while this has already given rise to many advantages to the members of these Associations, the foundations have been laid for development in a much greater degree in the future." It was also decided that the Manchester Association should have the honour of making the presentation of a "Kodak" to Mr. Holton on behalf of the Joint Council.

The Council, after a long discussion on the question of education and examinations for junior members of the profession, approved of the following resolution, which was submitted by this Association: "That the Institution of Gas Engineers hold an examination which would be the standard examination in the gas industry in place of the City and Guilds examination; and that entrance to the Institution as associate member be based on the results of this examination." Five members of the Joint Council were appointed to meet the five representatives appointed by the Institution of Gas Engineers, and endeavour to formulate a scheme in accordance with the above resolution. The scheme, though proceeding slowly, is bound to result in a considerable modification and improvement of the present system of a gas engineer's education.

It was reported that, owing to the difficulties prevailing during the war, the response to the scheme for the collection of data relative to "Retort-Settings" has been very disappointing; and it was therefore decided to allow this matter to lie on the table.

The Council again announced with regret that there has not been any competition for the prizes offered by Mr. Franklin Thorp; and in consequence the scheme has been discontinued. Mr. Garlick's prize was not awarded last year, as there was only one competitor; but the paper has been judged with the one read this session, and the award has been given to Mr. J. W. Thornley for his "Notes on Gas Distribution." Mr. Fairhurst's prize cannot be awarded, as there has been only one paper read before the Association dealing with a manufacturing subject.

The balance-sheet was presented by the Hon. Treasurer (Mr. J. Robinson), and showed a credit balance of £15 16s. 5d.

Vice-President, Hon. Secretary, and Council.

The President announced that only one nomination had been received for the office of Junior Vice-President—Mr. James Bridge (Bolton), their esteemed Hon. Secretary. He had therefore great pleasure in declaring Mr. Bridge elected.

Mr. James Bridge, in thanking the members, remarked that he would have to give up the position of Hon. Secretary, which he had held for six years.

The President announced that Mr. J. Alsop (Bolton), who had formerly been Hon. Secretary, was the only nominee for the office of Secretary; and he had pleasure in declaring him elected.

Mr. J. Alsop thanked the Association, but made it quite clear that he was only accepting the office for a short time.

Mr. J. Robinson (Altrincham) was re-appointed Hon. Treasurer.

Messrs. H. C. Applebee (Manchester), W. Buckley (Manchester), G. Dixon (Wallasey), J. W. Nicholl (Radcliffe), and J. B. Stewart (Rochdale) were elected to the Council; and they, along with Messrs. S. Carter (Garston), F. W. J. Belton (Macclesfield), and W. L. Heald (Preston) constitute the New Council.

The Auditor is Mr. C. Berry (Hyde).

A hearty vote of thanks was passed to the Council for their work during the session.

Presentation to Mr. A. L. Holton.

The President (in accordance with the resolution reproduced in the Council's report), on behalf of the Joint Council of all the Juniors of the country, said it was his pleasure to present Mr. Holton with a Kodak camera, as a token of appreciation of the work done by him as Hon. Secretary of the Joint Council. Mr. Holton, in bringing together a body representing the four Junior Gas Associations had rendered valuable service; and he hoped that in the future the Joint Council would achieve ever greater results.

Mr. Holton thanked the President for his kind remarks, and said that whatever he had done for the Joint Council of the Junior Associations had always been a pleasure; and he thought the joint meetings were exceedingly valuable. He should appreciate the Kodak for the good fellowship and kindly feeling it stood for.

Presentation to Mr. J. W. Thornley.

Mr. T. Duxbury (Oldham), at the request of the President that he should undertake this duty, said he had been asked to adjudicate on the papers read by Mr. J. W. Thornley, "Notes on Distribution," and by Mr. J. B. Stewart, "Distribution Problems." He had read them very carefully, and had come to the conclusion that both were excellent, and each deserved a prize. It would be very interesting to have another paper dealing with the distribution side of the industry. He thought there would be a great revolution in the manufacture and supply of gas, in view of the competition of the super-power electrical scheme. For heating, gas still had an open field; electricity could not compete with it. Mr. Duxbury proceeded to give some instructive figures regarding the use of low-grade gas; and he also dealt with the question of mill and general lighting by gas, and the use of gas for boiler firing. As they had been experimenting on the question for some twelve months, he thought one of the Oldham members of the Asso-tion should be asked to read a paper on this subject. The prize he was now to hand to Mr. Thornley was a copy of "Distribution of Gas," by Walter Hole; and on behalf of Mr. Garlick (the donor of the gift), and the Association, he had much pleasure in making the presentation.

Mr. Thornley (Salford) thanked Mr. Duxbury, and said he should prize the book as the donor had been connected with the Association from its infancy.

The New President.

Mr. Teasdale, in introducing the new President, Mr. W. Fletcher, thanked the Council and Association for the support given him during the past session.

Mr. W. Fletcher, of the Garston Gas-Works, Liverpool, then took the chair, and said his first duty was one of pleasure—to propose a hearty vote of thanks to Mr. Teasdale for the able and energetic manner in which he had carried out his work as President.

The vote was heartily carried; and Mr. Teasdale suitably replied.

Mr. Fletcher next delivered the following

INAUGURAL ADDRESS.

In electing me to be your President for the coming year, you have done me an honour of which I am fully conscious; and the appreciation I feel is a little difficult to put into words. However, I thank you for your trust, and hope I may be able to justify it. If our Association prospers as much in my term of office as it has under former Presidents, I shall feel that my efforts have not been in vain.

Value of the Junior Associations.

The standing and importance of the Junior Gas Associations is daily increasing; and when we remember that the juniors of to-day will be the seniors of to-morrow, this importance is more clearly realized. The scientific knowledge and information which members of these Associations can obtain by regular attendance at our meetings and by the free and open manner in which the discussions are conducted, is perhaps not generally realized. Even to-day we have members of the gas profession who, though quite eligible for membership in our Association, have not yet come forward. In many cases, this lack of interest is due to their not knowing that they are eligible; and it is the duty of all members to see that all eligible non-members are provided with the necessary information and form of application. Good as our numerical attendance has been in the past, it is hoped that, with the signing of Peace and the return of more normal conditions, our future meetings will be even more largely attended.

Reconstruction.

The choosing of a subject upon which to address you to-day presented some difficulties; but at a time when the great task of almost every industry is "Reconstruction," perhaps a few remarks on this question would not be amiss. What are gas undertakings doing in this matter. When the Government are talking of large central electric power generating stations for the purpose of supplying the country with cheap electricity for lighting, heating, and power, it is high time for us to look to our laurels. Certainly, we have the newly-constructed National Gas Council, whose work and energies will be invaluable to the profession; yet without the individual efforts of gas undertakings, who must continually keep the advantages of gas before their consumers, we must fail. Unfortunately, the industry has suffered very severely during the last three or four years. Apart from the great shortage of labour, the extremely poor quality of coal which we have been compelled to carbonize has resulted in gas of lower and uneven quality. This has in many cases resulted in dissatisfied consumers, who fail to appreciate the modern difficulties of the gas engineer, or even make due allowance for the times. These consumers must be very carefully nursed-back to us, and given every attention possible.

Co-operation with Gas Appliance Manufacturers.

Manufacturers of gas appliances can do a great deal to help us. We must have a good supply of useful and efficient, and yet cheap, appliances of every description, both domestic and industrial. Since 1914, the majority of these firms have been engaged upon other work of various kinds. Consequently the gas side of their energies, as far as the general consumers are concerned, has been more or less at a standstill. Great as were the energies of gas appliance manufacturers before the war, the time is rapidly approaching when even greater energy and ingenuity must be put

forward to help us overcome our rival, and keep up the steady progress we were most surely making. One branch of the industry which has perhaps made more progress during the last four and a half years than ever before, is the manufacture and application of gas-heated furnaces of every description. The experience and knowledge gained by the manufacturers in this branch must, and we may be sure will, be taken full advantage of by both manufacturers and gas undertakings alike.

On the other hand, all the energy and skill of the appliance manufacturers will be of little or no avail unless gas undertakings can work in conjunction with them and supply a cheaper and more uniform gas, which will help to make the installation, be it either domestic or industrial, a real success, and so produce a satisfied consumer; for it must be realized that one really satisfied consumer is worth more to us than six dissatisfied ones, as the former will generally instal more and yet more gas appliances, while the latter will often go over to our rival.

IMPORTANCE OF BYE-PRODUCTS RECOVERY.

It would seem that one of the first ways by which the price of gas could be brought down is the full and efficient recovery of bye-products. In the past, we have given rather a secondary consideration to this matter. The Germans bought large quantities of tar and pitch from this country. And what is the result? They have, or had, the aniline dye industry in their hands. The profit was theirs, the loss ours. When one remembers that the first aniline dye was made in this country—in Warrington—and although we had plenty of raw material to work upon, the discovery was allowed to be neglected while a German chemist in the employ of the firm returned to Germany with the information which later built up for them a world-wide monopoly, we see more clearly how lax we have been. Again, take the case of benzol, toluene, cyanogen, sulphur, ammonia, &c. Are these recovered to the fullest extent? If they are not, how can we expect to hold our own, and make headway? An industry which is not advancing is most assuredly on the decline.

EDUCATE THE CONSUMER.

It is an indisputed fact that ignorance in the use and manipulation of gas appliances is the cause of gas undertakings losing consumers. Therefore, it would seem that the education of the consumer in the use of such appliances is one of the first tasks that we should undertake. By the term "education," I mean the supplying of clear and simple facts on the utility and efficiency of various appliances, such as burners, gas-fires, cookers, gas-irons, geysers, radiators, furnaces, muffles, &c. What percentage of gas consumers know how to proceed to clean and regulate an ordinary incandescent burner? Not 50 p.ct. of them, we may be sure. The ordinary gas adjuster on a burner is a blessing to the man who understands its working and use, but is most certainly a curse to him who is ignorant of it. Then with regard to the air-sleeve. One often sees bits of paper pushed into the air-holes—probably pushed too far, and so causing the stream of gas to impinge on the side of the mixing chamber, resulting in loss of efficiency of the burner, or we see a piece of paper tied round the sleeve in such a manner as to cause a slightly luminous flame, resulting in dirty burners and mantles by carbon deposit. This is only one example of the many dodges practised by the ignorant consumer, not only on burners, but on all descriptions of appliances. The result is that the gas is accused of being bad or dirty, and the undertaking is immediately condemned by the annoyed consumer. On the other hand, if an inspector, properly trained in such matters, were to have about 5 minutes with this troublesome burner, or fire, &c., he would be able to thoroughly clean and adjust it, giving such satisfaction and delight to the consumer that, with a little persuasion, he may be induced to instal a gas-fire, or even buy or hire a gas-cooker, a gas-heated boiler, or a gas-iron, which would help to make the domestic duties of the house more of a pleasure.

In passing, it would be well to remember that the great domestic problem which is before the housewife of to-day could easily be made good use of by the enterprising gas undertaking, as that lady will certainly be on the look-out for any labour-saving device which is efficient and at the same time economical. Here is a great opportunity for those gas undertakings that are in a position to meet an immediate increase of business. Advertisements could be inserted in the local papers, circulars giving concise, yet full, information could be published and sent with the gas bills, or such information could even be printed on the back of the bills. The advertisements should be carefully thought-out, and be of an arresting and impressive nature. The catchy American method of advertising is certainly very effective, and might be followed with advantage.

Having made the consumers anxious to avail themselves of the scientific knowledge offered by the gas undertaking, the work of the trained and qualified inspector begins. He should be turned out armed with full information regarding cost—hire or purchase, including fixing—efficiency, working results, and method of obtaining the best results, of any type or pattern of gas appliance, and the relative costs of gas and electricity. This could be arranged in booklet form, and revised from time to time, according to requirements.

A GOOD MAINTENANCE SYSTEM DESIRABLE.

Following this, a satisfactory and economical system of maintenance for any and every type of gas appliance should be offered at such a tempting figure as would make it extremely difficult for the consumer to refuse. An efficient maintenance scheme offers great advantages to both sides, as it enables the consumer to obtain the best value for his money at a minimum amount of trouble, and it also gives the gas undertaking a chance of introducing more gas appliances into the dwelling house, hotel, or factory—so increasing the sale of gas, which, after all, is the all-important point. In the first place, a special grouping system, in order to save time and travelling expenses, should be devised. Secondly, it is preferable to have either women or youths trained for this work, as they have been found more suitable in every way. Free maintenance is not desirable, as undoubtedly this system is abused; but the charge should be such as to discourage abuse and yet encourage the consumer to take-up the scheme.

TRAINING WOMEN FOR MAINTENANCE WORK.

Women have been tried in Liverpool for this work and found to be very efficient and attentive. They received two months' training, five weeks of which were spent inside, where they were instructed in the construction and working of gas-burners, fires, and cookers. Burners of every make and type were purposely put out of action in every possible way—such as too much air, too little air, too much gas, too little gas, dirty burners, burners with nipples not drilled true, &c.—and the women were instructed how to remedy the different defects, until they obtained a surprising degree of skill and efficiency. The remaining three weeks were spent on the district (along with an intelligent fitter), which gave them the necessary practical experience and confidence.

Below is the outline of a scheme for the maintenance of consumers' burners at a nominal charge; all materials of the best quality, at the lowest market rates, being purchased from the gas undertaking. It should be noted that market rates ought not to be cut, as this only leads to trouble between the local dealers and the gas undertaking. These prices are based on 70 burners being maintained per day by women labour at 33s. 6d. per week, or 5s. 7d. per day. An average taken over a number of years shows the mantle breakage to be three per burner per annum. There would be a profit of about 2¾d. per mantle. Additional profit would be made on the supply of globes, chimneys, &c. Where the work necessitates the using of long ladders over moving machinery, a special price would be quoted. The net profit made by any maintenance scheme should be put back into the scheme, and so make it more attractive.

TABLE "A."

No. of Burners.	Rate per Visit.	Charge for 6 Visits per Annum.	Actual Cost of Labour.	Profit on Mantles.	Charge for 8 Visits per Annum.	Actual Cost of Labour.	Profit on Mantles.	Charge for 12 Visits per Annum.	Actual Cost of Labour.	Profit on Mantles.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Up to 4	0 2	1 0	2 0	1 10	1 4	2 8	2 9	2 0	4 0	2 9
6	0 2½	1 3	3 0	2 9	1 8	4 0	4 1½	2 6	6 0	4 1½
12	0 3	1 6	6 0	5 6	2 0	8 0	8 3	3 0	12 0	8 3
18	0 4½	2 3	9 0	8 3	3 0	12 0	12 4½	4 6	18 6	12 4½
24	0 6	3 0	12 0	11 0	4 0	16 0	16 6	6 0	24 0	16 6
36	0 9	4 6	18 0	16 6	6 0	24 0	24 9	9 0	36 0	24 9
48	1 0	6 0	24 0	22 0	8 0	32 0	33 0	12 0	40 0	33 0
60	1 3	7 6	30 0	27 6	10 0	40 0	41 3	15 0	60 0	41 3
80	1 8	10 0	40 0	36 8	13 4	53 4	55 0	20 0	80 0	55 0
100	2 0	12 6	50 0	45 10	16 8	66 8	68 9	25 0	100 0	68 9

GAS-FIRES.

In the year 1911, the Liverpool Gas Company launched a scheme for the simple hire of gas-fires, including maintenance, which has proved satisfactory to all concerned. The fires chosen were the Richmond Stove Company's "Arabian," "Bavarian," and "Castillian." These three fires cover a very wide range in design; the "Arabian" fire having a plain half-round top, the "Bavarian" a horizontal top, in which is fitted a boiling ring, and the "Castillian" a horizontal top relieved by fancy scroll work. These fires have been supplied in 10 in. and 13 in. sizes, and (pre-war) were fixed free and maintained in good working order for 1s. 6d. and 1s. 9d. per quarter respectively.

Under this scheme the fires are examined three times per annum, when the burners are cleaned and adjusted and all broken radiants replaced. An average shows the cost per visit to be 6·42d., which includes time and materials. The pre-war cost

to the Company was only 3·52d.; but the high price of labour, in addition to the great increase in the cost of radiants, has caused this high figure. It is surprising the number of repeat orders that have been received; and there are many cases where consumers have had fires on the hire maintenance system fitted throughout their houses—in one case to the extent of 13 fires—thus proving their complete satisfaction.

COOKERS.

Cookers have also been supplied under the same scheme. The ones chosen in this case being the "Briton" and the "Premier," both made by Messrs. John Wright & Co. These cookers are of a high-grade finish, with polished cornice, hinges, and door fittings, lined and packed throughout, and fitted with a white enamel removable tray on the oven top. All burners are easily detachable for cleaning. The control taps are fitted along the front of the cooker, which allows it to be fixed in a small recess if necessary. The fittings supplied are as follows: Drip tin, grill pan and grid, meat hook, two grid shelves, and one browning shelf. All fittings are maintained in good working order free of charge by the Company, except in the case of careless breakage, when the cost price of the fitting is charged to the consumer. It has been found that the "Premier," which is the larger of the two, is the one which has been in the greater demand. These cookers have also been fixed in canteens, in battery form to any number desired—the taps being on the front allows this formation; the advantages being a continuous hot plate and a number of ovens for use at different temperatures. The following table shows the sizes and particulars of the two cookers:

TABLE "B."

Design.	Total Height.	Total Width.	Depth, Back to Front.	Height, Centre of Flue to Floor.	Fittings.	Price per Quarter.
	In.	In.	In.	In.		s. d.
"Briton" .	31	21	19	25	1 large boiling ring, 1 small boiling ring, 1 griller.	1 3
"Premier"	33	23	19	27	1 large boiling ring, 1 medium boiling ring, 1 small boiling ring, 1 griller.	1 6

It may be mentioned that all the necessary cleaning, re-enamelling, re-tinning, and repair work is done by the Gas Company. In the case of fires, these are brought into the workshop, thoroughly cleaned, re-enamelled, stoved, fitted-up again, and tested before being sent out. The cookers—many of which come off the district in a very dirty condition—are stripped of all fittings, including the oven-lining and lagging, then dipped into a hot soda bath, after which they are thoroughly washed and allowed to dry ready for re-enamelling, stoving, and re-fitting. As in the case of fires, the cookers are all tested and sent on the district in a perfect condition. Unfortunately, the difficulty of obtaining cookers and fires, together with the labour problem and insufficient plant capacity, has stopped the further extension of this scheme. It is hoped, however, that as the position becomes more settled the Company will again be able to give the consumers the full advantages of the scheme. Once a good maintenance scheme becomes operative, it very soon advertises itself, and business steadily increases, owing to satisfied consumers informing their friends of its advantages.

The importance of encouraging consumers to instal cookers, and gas-fires is clearly shown in the following table of deliveries recorded in Liverpool.

TABLE "C."

ANNUAL OUTPUT OF GAS IN LIVERPOOL DURING THE PERIOD FROM 1904 TO 1918 (INCLUSIVE).

Year.	Gas Delivered. Cubic Feet.	Year.	Gas Delivered. Cubic Feet.
1904 . .	4,002,743,200	1912 . .	4,823,846,900
1905 . .	3,985,689,800	1913 . .	5,170,003,900
1906 . .	4,123,115,700	1914 . .	5,424,601,900
1907 . .	4,203,178,200	1915 . .	6,205,189,000
1908 . .	4,286,806,200	1916 . .	5,883,655,400
1909 . .	4,302,350,100	1917 . .	6,556,229,200
1910 . .	4,367,598,500	1918 . .	6,572,003,000
1911 . .	4,482,085,400		

It will be observed that there has been a steady increase in business since 1912, which is no doubt mainly due to the introduction of the scheme referred to.

Table "D" shows the variation that there was in the demand for gas during the twenty-four hours (averages given) of three days in December, 1917.

From this table it will be seen that the demand for gas is very considerable during the breakfast and dinner periods; and it may be safely predicted that in the near future the pressure scheme will have to be so altered as to give the maximum pressure, not at lighting time, but somewhere round the noon hour.

HIGH-PRESSURE SUPPLY.

Another branch of the gas industry which must be advanced and encouraged, and for which there is a great future, is the high-pressure supply. Unfortunately, the war has retarded progress in this direction, as many gas undertakings that were contemplating the installation of this system have had to allow the matter to rest in abeyance.

TABLE "D."

AVERAGE HOURLY DELIVERY OF GAS DURING DEC. 19, 20, AND 21, 1917.

Hour.	Delivery. Cubic Feet.	Hour.	Delivery. Cubic Feet.
6 to 7 a.m. . . .	878,000	7 to 8 p.m. . . .	1,740,000
7 ,, 8 a.m. . . .	1,344,000	8 ,, 9 p.m. . . .	1,561,000
8 ,, 9 a.m. . . .	1,408,000	9 ,, 10 p.m. . . .	1,517,000
9 ,, 10 a.m. . . .	1,127,000	10 ,, 11 p.m. . . .	1,234,000
10 ,, 11 a.m. . . .	1,088,000	11 ,, 12 midnight .	895,000
11 ,, 12 noon . . .	1,219,000	12 ,, 1 a.m. . . .	510,000
12 ,, 1 p.m. . . .	1,185,000	1 ,, 2 a.m. . . .	381,000
1 ,, 2 p.m. . . .	1,002,000	2 ,, 3 a.m. . . .	402,000
2 ,, 3 p.m. . . .	955,000	3 ,, 4 a.m. . . .	447,000
3 ,, 4 p.m. . . .	1,104,000	4 ,, 5 a.m. . . .	360,000
4 ,, 5 p.m. . . .	1,656,000	5 ,, 6 a.m. . . .	551,000
5 ,, 6 p.m. . . .	1,993,000		
6 ,, 7 p.m. . . .	1,830,000		26,387,000

Generally speaking the efficiency of the high-pressure installation is much higher than that of the low-pressure system, as it is not so easily affected by any variation of quality, which is sometimes unavoidable. A demand for this system of supply must be created and the need met. The great advantage and future of gas for power purposes was in a measure realized during the recent visit of our Association to the works of the National Gas-Engine Company. Here we saw gas-engines of every type, from 3½ B.H.P. to something like 1200 B.H.P.

EDUCATION OF THE GAS-FITTER.

In conclusion, it must be remembered that the education of the gas-fitter is a very important factor in our progress. An efficient appliance must be efficiently installed to be a success; and it is to the distinct advantage of gas undertakings to obtain the order for the supplying and the fixing of any appliance, and not to be satisfied to leave the fixing to the "jobbing fitter" or plumber, whose ignorance often results in the failure of the installation. This fact does not tend to help the gas profession in the progress it is determined to make.

On the proposition of Mr. FRANKLIN THORP, seconded by Mr. J. M'NICHOLL, the President was thanked for his address.

SOCIAL.

After tea, there was the annual social. Mr. Sandeford (Altrincham), Mr. F. E. M. Tooley (Liverpool), and Mr. R. Ridley contributed to the evening's enjoyment.

Proposed Publicity Section in the United States.

The suggestion for organizing an Advertising and Publicity Section in connection with the American Gas Association was referred to a Special Committee for consideration, in preparation for last month's conference of the Association. Advocates of the scheme are of opinion that some plan more ambitious than a Committee working in a section of the Association should be adopted by the industry, so that the advertising and publicity work may be recognized at its real worth, and its operation properly forwarded. They also feel that the establishment of an Advertising and Publicity Section in the Association will accomplish the desired results. It is pointed out by these advocates that, while a committee or bureau working with the general staff makes use of only a limited number of advertising and publicity men, an Advertising and Publicity Section would embrace all the talent in the industry, and set it working together for the general good. All the members of the section could be readily induced to send along their advertising and publicity matter; and in this way the Association would secure the best work of experienced gas advertising men at very little expense. Another argument is that an Advertising Section is necessary for the education of gas company managements, as well as for the education of consumers. It is said that the past history of the National Commercial Gas Association of America shows that at least 75 p.ct. of advertising effort on the part of the Association was lost on the gas companies because the managements had never been impressed with the true value of publicity and advertising; and that to merely send advertising matter, designed for the consumer's eye, to gas company managements, on the assumption that these managements will buy space in newspapers and insert the Association's suggestions, has accomplished very little in the way of educating the various communities served by gas companies. It will be gathered from the report of our American correspondent, which appears on another page of this issue, that the proposal was unanimously adopted by the American Gas Association.

Coal-Tar Returns Order Suspended.—The Minister of Munitions announces the suspension of the Coal-Tar and Coke-Oven Bye-Products (Returns) Order, dated Oct. 31, 1916. Until further notice, therefore, it will be unnecessary for persons engaged in the production, manufacture, purchase, sale, or distribution of any coal-tar or coke-oven bye-products to furnish as hitherto to the Minister of Munitions particulars as to output, sales, working of plant, cost of manufacture, deliveries, stocks, purchases, &c.

SCOTTISH JUNIOR GAS ASSOCIATION.

(WESTERN DISTRICT.)

Annual General Meeting.

The Annual General Meeting of the Scottish Junior Gas Association (Western District) was held in the Royal Technical College, Glasgow, on Saturday, March 29—Mr. T. G. Moffat, the retiring President, in the chair.

Annual Statement.

The Hon. Secretary and Treasurer (Mr. A. T. M'Donald), in his annual report and financial statement, said that the balance in hand was £15 6s., as against £13 8s. 9d. last year. The total membership was 194—an increase over the preceding year of twenty. There had been seven resignations, and twenty-seven new members had joined the Association.

Office Bearers.

Proceeding to the election of officials for the next session, the meeting chose Mr. Wm. A. White (Glasgow) as Vice-President, and appointed the following members to the vacancies on the Council: Messrs. A. Walker (Johnstone), J. Beveridge (Airdrie), James Jamieson (Dunfermline), John S. Elder (Provan), Walter Paterson (Tradeston), and Workman. Mr. James Dickson (Kirkintilloch) automatically becomes President. Mr. M'Donald (who on leaving Glasgow for Kirkcaldy relinquished the position of Secretary) is succeeded by Mr. J. Cubie (Glasgow), whose term of the secretaryship was interrupted when he joined the Army.

Mr. Walter Grafton (Glasgow Corporation Gas Department) delivered an address entitled—

"LOOKING AROUND."

Now that hostilities are practically at an end, we must devote ourselves to the needs of the future. The scarcity of materials for manufacture and repairs has caused much anxiety; and with fewer men available, our resources and ability have been taxed to the utmost in order to supply the essential needs of customers. The cessation of hostilities unfortunately has been followed by unrest in the labour market. I am optimistic enough to believe this is, however serious, a passing phase. But it will mean that the cost of materials and labour for gas making will never return to pre-war levels. Therefore, we must do our best in striving to obtain the utmost value from the materials, plant, and labour employed.

The cost of production and operation depends on adequate means, and that a public service corporation should at all times aim at supplying a soundly uniform quality of gas or any other material, as coke, &c., at a fair price consistent with good service. The demand for good gas is greater than ever; for be it remembered our patrons are many, and the uses to which they put it very varied. The success of the gas business depends on the goodwill and satisfaction of the users. The business will stay with us permanently if we will but study its requirements. Be prepared by having your plant always in trim, and avoid running short of essential materials. To-day it is difficult to have a large stock of coal; but with regard to the plant, whether on reserve for sudden emergency, or in operation, it should be kept in perfect repair, ready for service at short notice. There is no economy in starving a plant; and satisfactory performance depends upon the suitability of all apparatus. Avoid human and material waste at all costs.

We must broaden our service to the public, and at the same time make our business less dependent upon the sale of one commodity. Our duty to ourselves demands that we spare no effort to this end. With the conditions which confront us to-day, we must do everything to increase the efficiency of all the apparatus, and adopt every improvement likely to decrease manufacturing costs. Labour-saving devices must be introduced as far as possible. Coal and labour are now double the figure ruling in 1914. We must try and employ less capital, but equip our works so as to use less materials and labour.

The word labour means much at the present time. But it represents the employees; and our relations with them must ever be tempered with justice. We must establish personal relations with the men—have an interest in them; and, while this applies alike to the foremen, it is in no way to usurp his authority over the men, but to establish a better feeling or relationship with the employees by every means possible. The man is rare who will not respond in zeal and devotion to a kindly personal interest. The suspicious man will thus be stamped-out when he feels that your interest is genuine, and, in return, give of his best. The successful manager is he who feels himself as much a trustee for the interest of the employees as for his employers. It is to this end that we must cultivate him in order to bring down the cost of gas production; and our business will grow and broaden beyond our dreams, and find favour with all men.

VERTICAL RETORTS.

Some reference to vertical retorts may not be out of place. From experience with the "Glasgow" system, one is constrained to believe they could be more cheaply and effectively heated to a more desirable carbonizing temperature by producer gas made in a separate generator. With the present method of construction and heating, walls of the hot-gas ports, passages, and retorts become coated with an incrustation of dust and foreign matter to such an extent that it is purely a non-conductor, and so prevents the proper heating-up of the material, and makes it more difficult to attain the desired carbonizing temperature. As I conceive the position, what we want are combustion chamber temperatures to be manageable at will, securing thereby a limited ignition or lower temperatures at the bottom of the retorts, increasing to an active combustion zone at a higher, and necessarily narrower, region. Such a method would secure a longer life for the bottom mouthpiece; and (by no means the least consideration) a greater make per retort would follow per ton of coal treated. If steaming be desired, maximum time contact is necessary with a slow flow of superheated steam. Success is partly achieved by this method of heating; for the steam and CO_2 would be reduced to excellent water gas by the time the gases reached and passed through the more highly-heated area or zone of the charge. There is no reason why 15,000 c.ft. of 500 B.Th.U. gross gas per ton of fair war coal should not be obtainable; the resultant gas having a low incombustible content.

These systems of carbonizing coal must be easily manageable in future if we expect to produce cheap gas. To achieve this, we must adopt ammonia-recovery gas-producers. With such a process, not only is the nitrogen contained in the coke recovered as ammonia, but, by the gasification of the coke, a ton should produce 120,000 c.ft. of at least 130 B.Th.U. gross gas, which, after the screening, washing, and extraction of the ammonia, is by far the most simple and economical way of heating vertical retorts. It is simply one of operating dampers or valves. A relief holder, in which to store the gas, would be an advantage. After a careful study of this proposition of consuming coke in either the solid or gaseous form, and using the quantity of fuel employed last year, the extra sulphate obtainable would more than pay for the labour involved in the manufacture of the washed producer gas. It may seem a mistake to remove the sensible heat of the producer gas; but we do this daily in handling and firing with quenched coke. Sensible heat can easily be restored by a system of recuperation employing waste heat.

The ease and the facility of handling gaseous fuel are at least attractive, and worth a trial. Another distinct economy could be secured in the lessened expensive conveyor plant and separate internal producers, with their somewhat heavy maintenance.

One or two good-sized ammonia recovery gas-producers would take the place of many existing producers, with all their attendant difficulties, &c., in working them to advantage, and then often at a disadvantage, due to the class of coke employed. The one present difficulty—dust incrustation—would be for ever removed, resulting in a lasting economy of fuel, yet enabling the attainment of better temperatures.

STEAMING HORIZONTALS.

A word or two relating to steaming horizontals, with the idea of producing water gas. This will have to be done more scientifically than is practised at a few works at the present time. Such works may be obtaining 2000 c.ft. of gas extra per ton of coal carbonized per day; but if the engineers only knew it, they are losing fuel, gas, material, and time to the value of a pound in securing seven shillings' worth of gas. This practice is economically bad, and has nothing to recommend it.

IMPORTANCE OF COAL QUALITY.

Coal, the all essential for our industry's success, must be looked at in another way than hitherto. Considerable improvement would follow if it were possible to secure all our year's requirements from the least number of coal pits. In other words, a gas undertaking should be empowered to take the total output of a pit, yielding a suitable gas coal, nearest to hand, and any extra from an adjacent mine, at a fair price. This would ensure security as to quality. It not, the price should be based upon the calorific value of the coal. Our gas would then be more uniform in quality, and the fuel put into the producers would the better enable one to keep more uniform heats; and so the production of gas, &c., would become, so to speak, standardized. This seems the more desirable now that we are considering the method of selling gas by its value in B.Th.U.

CHARGING FOR GAS ON THE HEATING BASIS.

An interesting communication by Dr. Charles Carpenter has appeared in the "Gas World," advocating that gas should be charged for on its heating basis, and that consumers should pay according to a definite selling unit. The standard unit he suggests seems too high, yet 100,000 B.Th.U. (the figure proposed) is only a fifth of 1000 c.ft. of 500 B.Th.U. gas. He says that electricians sell energy, and we must do the same. Then would it not be better to fix upon the equivalent of a B.T.U. of electricity —*i.e.*, 3425 B.Th.U., according to Prof. Fleming.

A unit of current is 4¾d. in Glasgow to-day, and a similar unit of gas priced at 3s. 9d. per 1000 c.ft. is only 0·308d. The ordinary man in the street can see the great advantage gas has over electricity; but there is some doubt about him realizing gas to be cheaper if the price be thirty times more than the price of the electric energy standard. There are other considerations besides price and heat units that largely affect the adoption of this alluring proposition. One thing, the consumer might think the gas undertaking could not charge him for a lot of incombustibles. If they are there, 1 B.Th.U. will not be as good as another in better company. Consequently, commercial people may take a wider

view of this proposal. One thing is certain, which is that it is against the interests of any gas undertaking to waste capital, spent on distributing plant and mains, by sending large quantities of inert gases through the mains to their customers. They want potential energy, not a quantity of useless gas.

PLENO GAS.

Pleno gas is of low-grade value, and more enlightenment is needed. Many years ago, I experimented on similar lines; and while certain tempting results were obtained, it was considered bad practice, apart from any possible danger, to add 20 to 25 p.ct. of air and charge for the whole as 100 p.ct. gas—it is not fair. A consumer may be supplied with the greatest number of B.Th.U. for his money; but owing to the bad company they are associated with in the service, he cannot make economical use of them. A 300 to 350 gross unit gas is of no earthly domestic use, unless perhaps supplied without a meter to register the quantity. Gifts are generally acceptable, but not this wind-and-clinker gas.

Satisfaction must be stamped as it were on all gas issuing from any lighting, boiling, or fire burner in the homes. To be effective in any one, and not all, will not do. We must advance to the highest efficiency the methods of utilization. One reads: "Is the gas industry really giving the consumer only 1000 c.ft. when he could have 3000 c.ft. of gas for the same money?" Think over this question—it requires investigating. By adding air to coal gas, the district pressures must be increased considerably if we are to maintain the consumption of gas at the burner; and, if maintained, there is a loss in effective work done in a given time, depending upon the volume of air added, to as much as 30 p.ct. as compared with good coal gas. To say one can obtain the same effective work with "profiteering" gas as with a good gas of 500 B.Th.U. is not sufficiently clear to the lay or customer's mind, when he knows it takes longer to do the work, whether it be of the simple nature of boiling water in a kettle. Where a consumer's account is not unduly increased, it is due to the pressure being kept down; but he has had to pay for it in extra time waiting for the work to be done to what was customary in pre-war days. With low-quality gas, the consumption must be increased so as to expend the same amount of heat. From results obtained, it is apparent that the specific gravity of the different gases used exerted no appreciable influence on the proportion of primary air drawn in; the smaller quantity drawn in by the poorer gas, as compared with the richer grades, being accounted for by the quantities of gas passing through the burner being much greater with poorer gases in order to secure the same expenditure of heat—*i.e.*, B.Th.U. per hour.

The intensities of combustion of the separate gases in a mixture are not the same. In a bunsen flame, the position of the inner cone depends on the velocity of issue of the mixture of gas and air being equal to the velocity of the backward propagation of ignition. Therefore, other things being equal, those gaseous mixtures have the higher concentration of heat in which the inner cone loses its formation, and rests approximately on the top of the burner. For proof of the intensity of combustion of hydrogen, one need only quote Bunte's figures on the rate of propagation in air of the following mixtures:

Mixtures of CH_4 and air	1·97 ft. per second.
,, coal gas and air . . .	4·26 ,,
,, hydrogen and air . .	13·78 ,,

Hydrogen as a gas in the free and uncombined state is rather poor stuff. Its calorific value per foot is only 325 B.Th.U. But when in the combined but fluid form, it heads the list with more than 62,000 B.Th.U. per lb. Metaxylene has a fair boiling point; but substituting hydrogen for one of the methyl radicals, toluene is formed, having a boiling point 110° C. Replace another methyl by hydrogen, and we have benzene boiling at 78° C. All liquids or gases having combined hydrogen yield greater heating values. It is for this reason that town gas is the better for having a percentage of hydrocarbons, as CH_4, C_6H_6, &c., in the gaseous state. In use for heating, such a gas, on combustion, has a flame volume capable of filling the radiants with flame contact, and, if properly adjusted, yielding excellent results. Another point, and a desirable one, is that with this kind of gas supplied to gas-fires, one obtains slower combustion, wherein lies true economy; and so desirable is it, that consumers do not readily complain of larger gas bills.

Another point with regard to "Pleno" gas which the advocate asserts about "the fallacy of inerts," and states that when people talk of gas containing inerts, it only shows their ignorance. It cannot be considered good taste to say we "have for so long flaunted our ignorance before the public." The percentage of incombustibles should certainly not exceed 15, more especially of CO_2 and N_2, both being detrimental to thermal efficiency, since they lower flame intensity, and consequently heating and mantle results. If the incombustibles are no more than quoted, the gas for heating would be much more effective than it is now, and kettles would boil more quickly. For be it remembered less gas is obtainable for a penny, and the gas is of less value than in 1914. Nitrogen can be obtained free from the atmosphere without going to the expense of sending it through pipes in order to make an exorbitant charge for it.

Illustrations are now given of the Pleno boiling burner, which is behind the times by nearly twenty years. There is a cooker in Glasgow fitted with similar, but relatively perfect efficiency, burners which give excellent results with all qualities of gas, and never light-back. Besides, over 2 gallons of water are raised to the boiling point in about two hours, and free of cost.

DISTRICT WEAKNESSES.

Some gas consumers do not pay enough for services rendered, by simply paying for meter rent where electricity is the chief illuminant, and often supplying current to radiators, &c. Gas in these circumstances is only a stand-by, yet the gas undertaking is put to expense, regardless of whether the consumer uses gas. The meter being installed means surveying or index taking, accounts rendered and collected, amounting perhaps to only a few shillings. These cases should be charged for meter and service pipe repair, apart from other gratuitous attentions or services. The method of charging (say) 2½ to 7½ p.ct. of the capital cost of running a stand-by supply would assign to this class of customer the costs actually incurred on account of the customer, and for his benefit only.

As to ordinary meters generally, since 1914 there has been too little attention paid to the quality of gas at the works, partly due to necessity. So now we are finding that by oil-washing or the extraction of benzol, &c., an alarming deterioration of the consumer's meter is the result; and no amount of vaporizing or pistol-spraying of oil into them is of any but a trifling remedy for a few out of the thousands at fault. Briefly, there is a tendency to save a few pounds on the works, while thousands are going to waste on the district. This condition of things requires immediate steps being taken to stop the evil; and it should be dealt with having the fullest regard to the interests of the consumers, and so rendering an actual service to the public. There is a business value in having satisfied customers.

GAS-FIRES ON HIRE.

Now that the price of gas is so high, there is a general desire among a certain section of gas consumers to economize in all possible ways. One method seems to be to return the gas-fire, to avoid the yearly charge of 5s. or more for the hire. It would be a sound policy to allow such fires to remain in the homes of the people for the small sum of 6d., or no charge at all, instead of going to the expense of removing them with their connections. To-day, we will estimate the removal charge at 8s., without considering damage in transit; and should a fire be wanted again, the refitting charge would certainly amount to 20s. These fires are generally in good keeping, free from rust, &c., in most houses. Besides, the fire is in position should it be required, which undoubtedly it would be at certain times. The wisdom of a bring-in policy is questionable?

PUBLIC LIGHTING.

In conclusion, a passing reference to public lighting may not be without interest, since there is a popular fancy that the use of gas for lighting is dying-out in the competition with electric light. For public lighting, however, there need be no competition. By the use of half-watt lamps electricity has certainly an advantage over gas; and now that labour wages are so high, it would appear to be a distinct economy, from a ratepayer's point of view, to instal half-watt lamps, or even one-watt lamps, in our public streets, for then a street could be lighted from one end by switch. In fact, whole areas, including many streets, of the city, could be linked-up, so that there would be no need for the lamplighter to go from post to post as at present. Any lamp not lighted could be seen (as a general rule) from the end of the street. This scheme would mean not only the saving of light to the last moment, for one lamplighter could do the present work of a dozen men every evening and morning. Then there is the great saving in wages. Besides the dictates of public safety, convenience, and economy, the efficiency of the scheme merits its adoption. The loss to the gas undertaking would be very little; and in many cases it would be to its advantage to avoid this consumption, for it is most felt when it is least wanted. The general up-keep of the electric supply and lamps could be arranged by contract with the electric supply undertaking.

There are other subjects one could mention, which, in themselves, and the conditions of things as now existing, demand attention and reform—like unaccounted-for gas, accountancy, oxide, &c. But these could with advantage be undertaken by some of the members next session.

Discussion.

Mr. David Fulton (Helensburgh), in opening the discussion, said the address contended that money was not everything, but they had found it very difficult indeed to make Labour think so. While there was far more sympathy than there had ever been on the part of the employer in relation to the employee, there was a greater amount of suspicion on the part of the employee, and the "Ca' Canny" policy had never been worse. If continued, this meant ruin for the country sooner or later. Mr. Grafton, he gathered, did not favour the steaming of retorts; but he spoke of the necessity of super-heating the steam. In his own experience, experiments had been made with super-heated steam before admitting it at the bottom of the retorts. There was no beneficial effect. Personally, he had no great faith in the steaming of horizontal retorts. Yet recently he was at a semi-private discussion on the subject, when a number of those present stated their experiences, and gave actual figures of work done over many months in steaming horizontal retorts, showing a very considerable saving, not only in coal, but in labour. He did not feel inclined to disbelieve their figures; and there might be something in it if it were done properly. Mr. Grafton had made a

strange and wonderful statement when he spoke about towns sending out gas of lower quality at lower pressure. In the towns he knew, the pressure had been increased very largely. One might send out a fairly rich gas which gave less service to the consumer than a poorer gas. Anyone selling gas at about 3s. per 1000 c. ft. was not doing the consumer an injustice; and there were many round about Glasgow doing it. Mr. Grafton had attributed the return of gas-fires to the annual charge of rental. At Helensburgh, they stopped hiring about three years ago, as he did not believe in the system. He had not had twelve fires returned per annum during the last four years. He thought Mr. Grafton should look elsewhere for the reason of the return of gas-fires. He should look into the pressure of the gas. The reason was that the fires were not giving satisfactory service even with what they knew was a fairly high-grade gas. The author had said that he was not pessimistic in his outlook, yet the address was one of the most pessimistic he had heard for some time. He did not know whether Mr. Grafton was getting ready to change his affections to electricity. Certainly electricity would beat gas if they were not going to send out a gas of lower grade and give higher efficiency. If they supplied gas of 500 or 550 B.Th.U., and left appliances as they were, then electricity was, of course, going to leave them out of a job some fine morning.

Mr. John Wilson (Motherwell) considered that Mr. Grafton had "looked round" with a field-glass. He was a bit pessimistic, but would probably be better pleased with the future when it did come. He did not think that the gas industry was going to go back, for the simple reason that the Commission that was sitting at the present time really meant to get to the bottom of the difficulties of the gas business. Until they got standardization put upon a proper basis, electricity was going to get a big start. He was not an advocate of high-grade gas. So far as he had gone, he had found that the lower they had gone down in candle power the better they had been serving the public in respect that complaints had been much fewer. In analyzing his complaints, he found that 95 p.ct. were due to dirt and ignorance. He thought that both these could be done away with if the gas supplier could continue his duties right up to the burner. Until they had this, he did not think they were going to give the best efficiency to their customers, because the consumer himself, who was not going to be bothered, could not get the best resnlts. Mr. Grafton had contended that vertical retorts could be more cheaply and effectively heated by producer gas made in a separate generator. This was also his opinion. He was surprised the other day, in Glasgow, to find in a certain installation that they had discarded a producer plant, and had reverted to semi-internal producers. He had discovered that the heating of retorts was very much cleaner with outside gas. In regard to labour troubles, the men did not appreciate what was being done for them. They wanted twelve-hours' pay for an eight-hours day; yet unless wages came down, nothing else would.

Mr. Reginald Cross (Tradeston) questioned the remarks in the paper on the reduction of capital. If materials were going to continue at the present cost, it was not going to be a question of reducing capital, but the opposite. It was a very desirable thing to have an amicable arrangement between labour and management; but there were some classes of labour which it would be impossible to please. In regard to a remark on benzol extraction by Mr. Grafton, he would like to point out that he had read that it took 8d. a gallon to recover benzol. Well, if it cost 8d. a gallon, and one obtained 1s. 4d. for it, there must be something in it. How many cubic feet did a gallon of benzol represent? He was interested in the remarks on Pleno gas; and he had been reading the report of the Research Committee. It seemed a very enticing prospect if they could get, at one-sixth the price, gas giving the same duty as that they were paying for now. It seemed a most remarkable thing to him if it should be so. If it were so, why had it not been discovered long ere now? The particular meeting which dealt with it was packed with experts; but not one was able to disprove what Mr. Helps had put forward. If Mr. Helps was able to give them gas at one-sixth of what they were paying now, he surely was a benefactor.

Mr. M'Donald said he took it that Mr. Grafton was not in favour of benzol extraction. But the dye trade was crying for it; and if they were to keep out foreign competition in the dye industry, they had to keep the benzol going. Only 50 c. ft. of gas per ton of coal was lost for each gallon of benzol. A lot of people laid the blame of the small flame value on benzol. It was not due to benzol. It was due to inert oxygen. The meter flaws were due to oxygen in the gas. Analysis of the deposits did not reveal naphthalene so much as rust; and the latter had been manifest particularly since oxide purification came in. This was the trouble with many to-day.

Mr. Walter M. Paterson (Tradeston) considered that the works in Glasgow got about fifty different kinds of coals, ranging from those that gave 5 p.ct. up to those that gave 25 p.ct. of ash in the coke. This was bound to have a bad effect on the producers. Under such conditions one could not expect to get an even quality of gas. He would also like to know what was to hinder the large works taking the output of one colliery?

Mr. Moffat also agreed that, so far as Glasgow was concerned, it would be a good thing to get the coal from one pit. Regarding Mr. Grafton's point about outside producers for heating verticals, it seemed a waste of time to go back to them, judging from his experience. One of the main points in efficiency was to allow the man in charge to run the verticals to suit himself. One class of verticals in one town gave a different result from the same class in another town. It depended not only on the coal, but upon the human factor. In regard to bringing in gas-fires from consumers, it would be better to throw them out of the window than to bring them in again. The sum of 8s. was a low estimate for the removal of a fire. In the matter of labour we must have finality soon as to working hours. It was going to cost more money, and prices must go up. But the price of gas must be kept as low as possible. Let the other charges go up—on coke, for instance.

Mr. Wright (Lockerbie) remarked that Glasgow could sell coke in Oban at 27s. per ton. He thought Glasgow should not compete with the smaller works nearer the door of Oban.

Mr. Moffat said that Mr. Grafton's remarks on Pleno gas should bring the whole matter to a solution, one way or the other. The author had been a great supporter of high-pressure gas lighting. Why did he not go in for this still, and let Glasgow people see what could be done in the way of high-pressure gas lighting in the streets?

Mr. Grafton, in a short reply to the discussion, dealt with benzol extraction and its equivalent. By stopping benzol recovery, he said, they would obtain 2000 c.ft. of gas; and this was better than getting 1s. 4d. per gallon.

The Social Side.

Following upon the annual meeting of the Association an enjoyable social evening was held in Sloan's Café, Argyll Arcade, Glasgow.

VERTICAL RETORT STEAMING TESTS AT SPRINGFIELD, U.S.A.

Among the papers presented at the recent meeting of the New England Association of Gas Engineers was one by Mr. L. J. Willien giving a record of some tests on the Glover-West continuous vertical retorts operated by the Springfield (Mass.) Gaslight Company.

The author said: Steaming with vertical retorts has been practised with Dessau retorts since their introduction in 1906. The steam is brought in at the bottom of the retorts during the last two hours of the carbonizing period. By using steam in this way, the yield of gas is increased about 20 p.ct.; the candle power is reduced 25 p.ct.; and the B.Th.U. is lowered 8 p.ct.

The steam is led in at the bottom, and passes up through the retorts—a chemical reaction taking place between the steam and the incandescent carbon, which results in the production of carbon monoxide and hydrogen or blue water gas. The temperature of the carbon with which the steam comes in contact has a direct bearing on the amount of blue water gas formed. It is very desirable to keep the temperature in the decomposition zone as high as possible. The following table shows the reaction between steam and carbon at different temperatures:

Effect of Temperature on Water-Gas Reaction.

Temperature, Degs. Fahr.	Percentage of Steam Decomposed.	Composition of Gas by Volume.		
		Hydrogen.	Carbon Monoxide.	Carbon Dioxide.
1240	8·8	65·2	4·9	29·8
1400	25·3	65·2	7·8	27·0
1540	41·0	61·9	15·1	22·9
1750	70·2	53·3	39·3	6·8
1770	94·0	48·8	49·7	1·5
1960	99·4	50·9	48·5	0·6

In order to obtain the most efficient reaction between the steam and carbon, it is advisable with an intermittent system of vertical retorts to introduce the steam during the last stages of the carbonizing period. With a continuous retort system, such as the Glover-West or the Woodall-Duckham, the steam can be introduced continuously.

Tests Made at Springfield.

The tests at Springfield were carried out in March, 1917, in connection with the investigation made by the Massachusetts Board of Gas and Electric Commissioners, relative to the adoption of a calorific standard for gas. One unit of Glover-West continuous vertical retorts was equipped with steam connections. The unit consisted of 24 retorts, which were operated for one week without steam, and for one week with steam. Records were made of the coal used, gas made, and quality of same; also the effects on the operating conditions, such as scurfing, &c. The coal used was taken from a lot that was known to be a uniform mixture.

Steam Supply, Measurement, and Superheating.

The connections for introducing steam into the retorts were made at the top of the casting connected to the bottom of the retort. The main steam supply was a ¾-in. line. At the inlet to each retort, the steam line was equipped with a valve and a disc with a ¼-inch orifice; the purpose of this arrangement being to obtain an equal distribution of the steam going into each retort, as without such an arrangement the retorts nearest the main supply line would get more steam than those farther away.

The amount of steam used was measured by placing a disc with a ½-in. orifice in the main steam supply line, with pressure gauges on both sides of the disc. The steam pressure was kept constant by means of a pressure regulator on the high-pressure side of the disc. The steam used was calculated from Napier's formula for the flow of steam through an orifice. This formula is:

$$W = PA \div 70$$

W = pounds of steam per second;
P = absolute pressure, pounds per square inch;
A = area of the orifice, square inches.

This formula holds as long as the pressure on the external side of the disc is less than 58 p.ct. of the initial pressure.

The steam was superheated about 200° Fahr. by passing it through two lengths of pipe placed in one of the waste-heat flues of the retort-setting.

Proper Amount of Steam.

The preliminary work showed that if too much steam was introduced, it would fill up the lower casting and condense—leaking-out around the lower mouthpiece. The amount of steam to be used was determined by gradually increasing the pressure on

the inlet side of the disc in the main steam-supply line until water began dripping around the mouthpieces. This occurred when the steam pressure was 23 lbs. per square inch. It was decided to regulate the pressure to 20 lbs. The amount of steam used (as calculated from Napier's formula) was 8400 lbs. per day, or 350 lbs. per retort per day.

Tests on Gas, Coal, and Coke.

A small sampling gasholder of 15 c.ft. capacity was used for collecting samples of gas for testing purposes. Gas was run into the holder from 8.30 a.m. until 4 p.m. This was then tested for B.Th.U. and candle power. Another sample was collected between 5 p.m. and 7.30 a.m., and tested in like manner. Once each week, the Chief Gas Inspector for the Massachusetts Gas Commission tested a day-and-night sample for B.Th.U. and candle power, and also took off a sample for complete analysis. Samples of the coal used were taken, also samples of the coke produced, and proximate analyses were made on them. Analyses of the gas, coal, and coke are given in the appendix.

Effect of Steaming on Operation Results.

	Without Steam.	With Steam.	Gain or Loss, per Cent.
Yield per pound, c.ft.	5·49	6·72	22·4 gain
B.Th.U. per c.ft.	540·00	519·00	3·8 loss
B.Th.U. per pound	2965·00	3480·00	17·6 gain
Candle power.	9·50	7·00	26·3 loss

The average number of retorts out per day for scurfing was 43·7 p.ct. less with steam than without. There seemed to be a marked difference in the formation of the carbon with steam and without steam. Carbon formed without steam is very hard, and requires considerable time to burn-off. It adheres to the retorts, so that if it is chipped off with slicing bars, very often some of the clay of the retorts comes off with it. This means considerable wear and tear on the retorts. With steam, the carbon formed is of an amorphous nature, which requires less time to burn off, and is easily removed with a bar—causing less wear and tear of the retorts.

Effect upon Reactions.

The gas analyses indicate that the general quality of the gas is improved. Without steam, the percentage of hydrogen, hydrocarbons, and the proportion of benzene in the hydrocarbons all indicate high heats. The coal gas made in inclined or horizontal retorts will contain from 10 to 15 p.ct. less hydrogen and from 1 to 2½ p.ct. more hydrocarbons with a smaller proportion of benzene (from a quarter to a third per cent.). In the vertical retorts, the hydrocarbons are probably broken-up into hydrogen and carbon; the latter being deposited on the sides of the retorts.

In using steam, it is found that the gas contains about 3 p.ct. more carbon monoxide and 0·5 p.ct. more hydrocarbons with less benzene. The hydrogen is about the same, or a trifle lower; whereas an increase equal to the carbon monoxide would be expected. Since there was a general increase in the amount of gas made, there probably was an increase in the hydrogen due to the steam; but the amount of hydrogen formed by cracking the hydrocarbons was less. Therefore, the net result would be no increase in the percentage of hydrogen. These facts would indicate that the steam had a tendency to "soften" the heats in the retorts.

Assuming that the increased amount of gas made was due to steaming, then from the increase in the gas made, only 24 p.ct. of the steam used was converted into water gas. On the other hand, if the increased amount of gas is assumed to be all water gas, the carbon used was 1343 lbs. per day. This is equivalent to about 1625 lbs. of coke as calculated from the carbon in the coke, shown by the analysis of the coke from the test without steam, in the appendix. The above amount of coke is about 1·9 p.ct. of the total coke produced. The coke analysis shows practically no loss in the carbon content of the coke. These results indicate that the steam in passing-up through the retorts travels around the walls of the retorts instead of up through the coke itself. Any increase in the amount of gas made is probably due to the steam reacting with the carbon deposited on the walls of the retort.

It was impossible to get any accurate figures as to the effect of the steaming on the tar and ammonia production, as there were no means of separating them from the tar and ammonia made by the inclined retorts and another bench of vertical retorts that was being operated at the same time. Some tests were, however, carried out on the ammonia in the gas leaving the retorts. The results obtained showed that steaming increased the production of ammonia about 12 p.ct.

Conclusions.

The following conclusions may be drawn from these tests:

1. Steaming with continuous vertical retorts is feasible. The yield of gas can be increased about 20 p.ct. with practically no loss in coke.
2. The calorific value of the gas is reduced between 3 and 4 p.ct., and the candle power about 25 p.ct.
3. The yield of ammonia is increased about 12 p.ct.
4. The formation of carbon on the sides of the retort is reduced between 40 and 50 p.c. The carbon that does form can be more easily and quickly removed, thereby effecting a marked improvement in the operating conditions.
5. Steam may be used to advantage with through horizontals or inclined retorts. While the increased yield may not be as much as with vertical retorts, there would undoubtedly be less carbon formed on the sides of the retorts, and in cases where considerable trouble is experienced with stoppages in the standpipes it will be eliminated to a great extent.

Stoppages in standpipes are generally caused by the high-boiling tar-oils condensing on the sides of the standpipes. On flowing down, the oils are cracked by the hot gases coming from the retorts, and deposit carbon. The presence of an excess of steam in the gases leaving the retorts would tend to lower the partial pressure of the high-boiling tar-oils, which would enable them to be carried as a vapour into the hydraulic main before condensing. The same principle is employed in distilling tar, where steam is blown into the hot tar in order to drive off the anthracene oils.

APPENDIX.

Table I.—Effect of Steam upon Gas Analyses.

	Without Steam. Per Cent.	With Steam. Per Cent.
Carbon dioxide	1·23	1·69
Ethylene	1·07	1·65
Benzene	0·97	0·95
Oxygen	0·00	0·00
Carbon monoxide	7·92	11·16
Methane	27·33	24·67
Hydrogen	57·69	56·18
Nitrogen	3·80	3·70

Table II.—Analyses of Coals Used.

	Federal. Per Cent.	Ocean West Moreland. Per Cent.	Wendell. Per Cent.	Average. Per Cent.
Moisture	1·57	1·21	1·08	1·29
Volatile	35·70	34·08	36 33	35·37
Ash	8·61	8·14	8·17	8·31
Sulphur	1·54	1·67	2·44	1·88

Table III.—Analyses of Coke Produced.

	Without Steam. Per Cent.	With Steam. Per Cent.
Moisture	0·12	0·22
Volatile	3·94	3·45
Fixed carbon	81·75	80·97
Ash	14·19	15·36

Sir Dugald Clerk's Society of Arts Paper.

Alluding to Sir Dugald Clerk's recent paper on "Gas and Electricity," last Friday's number of "The Engineer" said that it came as a useful corrective to the exaggerated views of the value of electricity that have been encouraged by the recent discussions on super-power stations, and were brought to a climax by Sir Eric Geddes's assertion that the main railway lines would be electrified. Sir Dugald Clerk, our contemporary continues, has been associated with gas power for the greater part of his life; and there is no living scientist in a better position to plead its cause. He gave a series of very striking figures, which showed that for all purposes save that of lighting—in which the half-watt lamp and the arc lamp enjoy the highest efficiency—gas is more economical than coal. He demonstrated, for example, that the very best and biggest station hypothecated would consume twice as much coal for the generation of the same amount of heat and power at the consumers' premises as would a gas generating station; while, at the same time, the gas-works would save the valuable bye-products which would be destroyed in the electric power plant. There is, of course, another side to the question. It may be quite true that the owner of a gas-engine obtains his brake-horse-power at the engine-shaft for a consumption of less of the nation's reserve of coal than does the electric motor user. But, on the other hand, it is comparatively rarely that the gas-engine can deliver its power directly at the point where it is to be used; and loss in transmission has to be allowed for. Sir Dugald Clerk is as well aware as anyone that there are more aspects than one to the problem; and he concluded his lecture with the observation that the extension of the industrial stage of our civilization can only be made possible by the co-operation of the Government with the gas, steam, electric, and hydraulic engineers, in order to ensure the full utilization of all our sources of heat, light, and motive power for the good of the community—even at the cost of some legislative interference with some industries.

Midland Junior Gas Association.—About sixty members of the Association paid a visit last Friday afternoon to the works of Messrs. John Wright and Co., at Aston, Birmingham; and at a meeting prior to the inspection of the works, Mr. A. Forshaw, M.Sc., the Chief Chemist, addressed those present. Mr. H. James Yates presided; and supporting him were Mr. T. H. Poulson (the President of the Association), Mr. T. F. E. Rhead (Hon. Treasurer), Mr. R. G. Marsh, Mr. H. W. Dean (Hon. Secretary), Mr. W. J. Pickering, and others. A hearty vote of thanks was passed to the firm for their courtesy.

Temporary Increase of Charges Act.—Orders have been made by the Board of Trade under the Statutory Undertakings (Temporary Increase of Charges) Act in favour of the Alliance and Dublin Consumers' Gas Company, the Ascot District Gas and Electricity Company, the Busby and District Gas Company, Ltd., the Comber Gas Light Company, Ltd., the Gorleston and Southtown Gas Company, and the Herne Bay Water Works Company. The Local Government Board have made an Order for the Pontypridd Urban District Council, raising the maximum price from 4s. to 5s. 6d. per 1000 c.ft.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

The Proposals of the Sulphate of Ammonia Corporation.

Sir,—My attention has been drawn to the paragraph on sulphate of ammonia, written by your Market correspondent, which appears on p. 44 of your issue of the 1st inst.

Your correspondent criticizes the proposals for marketing sulphate of ammonia by the British Sulphate of Ammonia Corporation, Ltd., on the ground that the Corporation would cut-out the export merchant. The account of our London meeting which appeared on p. 37 of the same issue, makes it perfectly clear that we do not intend to cut-out the export merchant, but that we intend if possible to make an arrangement with him which will be beneficial both to the Corporation and to the exporter. Seeing that we have emphasized this point at every one of the numerous and well-attended meetings which we have held in the provinces during the past month, it is a little odd that your correspondent should not have alluded to this aspect of the matter, seeing that he claims that his criticisms are based entirely on comments in trade circles.

It is also odd that while in your issue of March 29 he suggests that prices for sulphate of ammonia will fall to a level of £18 per ton, in his last report he arrives at the conclusion that "the old law of supply and demand will come into operation, in which case a rising tendency may be expected in sulphate." When he wrote his report of March 29 he evidently expected that the export merchants would have an unrestricted choice of purchasing market. But in the meantime he has discovered (erroneously, and misapprehending our proposals) that the new Corporation intend to sell "direct" for export. Supposing, therefore, that his earlier view of the market position is correct (although we do not say that we agree with him) and "the old law of supply and demand" causes a falling tendency, he will be able to refer to his timely strictures on the proposed selling methods of the Corporation as a contributory cause.

It would interest us to know on what authority he states "the new organization cannot compete with the old exporters on the question of cost to the maker." In order to ascertain whether or not this is the fact, it would be necessary for him to state how much the maker paid the export merchants in the past in addition to the 1 p.ct. commission which they usually added to their selling price. If these figures are forthcoming, we have not the slightest doubt that the new organization will be able to show a very substantial saving to the makers on working costs.

We are writing you at some length as we do not wish any misunderstanding about this matter. In view of the importance of the whole question to the gas industry, and the prominent position occupied by the "Journal," it is essential that your readers should not be misled by criticism based on misapprehension of the facts.

The crux of the whole question is this: Is it better for British makers of sulphate of ammonia that each one of the 700 makers should market his own product through merchants at home or abroad, who are free to make as much as they can out of the manufacturer, or is it better for those 700 to combine together and make a reasonable businesslike arrangement with the merchants? The latter is the course we propose to take; and we think there can be no doubt as to the right answer to this question.

D. Milne Watson,
Chairman of the Sulphate of Ammonia Association.

84, *Horseferry Road, Westminster,*
April 7, 1919.

Gas Units per Penny.

Sir,—At the present time the advisers of the Government, Sir George Beilby's Fuel Research Committee, the Institution of Gas Engineers, Dr. Charles Carpenter, and many others, are making a careful study of the important question as to the desirability of continuing the sale of gas on the old lines of volume at the price per 1000 c.ft., or the introduction of selling gas on the basis of heat units. In conjunction with this question, we must take into consideration the importance of the change that is being made by the adoption of a calorific standard as a substitute for the old illuminating power standard. It has been suggested by Sir George Beilby's Committee that gas might be sold on a heat unit basis, in the same way as an electrical consumer is charged for a Board of Trade unit of electricity. Dr. Charles Carpenter, who is an advocate for the heat unit system, suggests that the gas standard unit should be what he terms a decatherm, or 100,000 B.Th.U.

In considering this important subject, I am strongly of opinion that any new scheme or change introduced should be of a simple and understandable character, so as to secure the entire confidence of the gas-consuming public. At the present time, the majority of consumers are befogged, and cannot ascertain by comparison the true values of gas and electricity, and are therefore in ignorance of the sums they have from time to time to pay in their gas or electrical accounts. The electrical standard for the sale of electricity throughout the country is a Board of Trade unit, which is equivalent to 3420 B.Th.U. My principal object in writing this letter is to strongly advocate the universal application of the same standard unit for the sale of gas as is now used by electrical undertakings, so that the purchaser of either could readily ascertain the actual cost by comparison of the two commodities.

In a large number of towns electricity is being sold at the present time as follows:

One Board of Trade unit of electricity capable of producing 3420 B.Th.U. at 2d. to 6d. per unit.

I give you three examples of what gas can be sold for in comparison with the same Board of Trade electrical unit.

1000 c.ft. of gas of a calorific value of 560 B.Th.U., which is now sold at (say) 4s. 6d. per 1000 c.ft. net, could be sold at the rate of **3 units for one penny.**

1000 c.ft. of gas of a calorific value of 513 B.Th.U., which is now sold at (say) 3s. 1d. per 1000 c.ft. net, could be sold at the rate of **4 units for one penny.**

1000 c.ft. of gas of a calorific value of 410 B.Th.U., which is now sold at (say) 2s. 6d. per 1000 c.ft. net, could be sold at the rate of **4 units for one penny.**

These comparisons show that at the different prices gas can be sold on the heat-unit basis from 6 to 24 times cheaper than electricity.

The gas industry should endeavour by all means in its power to get these facts universally known, so that the public may be enabled to obtain the best value for their money. Sir Dugald Clerk, in his recent admirable paper, is assisting the gas industry in this matter, by pointing out the large amount of valuable energy produced from coal by the scientific methods of carbonizing it in gas undertakings, instead of the wasteful methods now generally adopted in generating electricity, which Lord Moulton pointed out was "a ghastly waste."

It must not be overlooked that the gas industry has for some time past been increasing the number of heat units in the gas per ton of coal carbonized; and there is no doubt that still further efforts in this direction will be rapidly forthcoming. If the gas industry is judged upon these merits, it can clearly and definitely show that the industry is the real and great conserver of coal for the benefit of the nation.

Southport, April 4, 1919. John West.

The Proposed Super-Station Electric Scheme.

Sir,—From time to time you have commented in your paper on the scheme for super electric power stations. In the Daily Press there have been numerous articles, informing the public of the magnificent benefits they are to obtain when this millennium is brought about.

In last Saturday's issue of the "Sunday Chronicle" there was an article by Sir Leo Chiozza Money, dealing with the value of our coal deposits, and the necessity for conservation. All that has got to be done is to put down super electric power stations in advantageous positions accessible for obtaining coal and for distributing electrical energy.

These articles do not give facts, but dwell on the ideal side of the question. In my opinion, there is only one way in which coal conservation can be coupled with cheap electric power; and that is by the carbonization of coal, obtaining the valuable bye-products, and utilizing the gas for either gas-engines or boiler-firing for the production of electric current. Has the gas industry no spokesman who can criticize these articles, and show the public that their salvation is not in electricity but in gas—in gas first and electricity afterwards?

Comments in the technical gas papers are very acceptable to gas engineers and the trade in general. But the public never see them; and I regard it as absolutely essential for the industry that somebody should take this matter up and put it to the public in its true light. The British Commercial Gas Association have done great publicity work; and I think it is a pity that these articles should be allowed to continue without being fully explained to the public at large by some competent and well-known person of standing in the gas industry.

I would suggest that a reply to Sir Leo Chiozza Money should be prepared and given equal publicity through the same medium.

Wilfrid Drake,
Joint Managing-Director of Drakes, Ltd.

Halifax, April 1, 1919.

Gas for Housing Scheme.

Sir,—We are pleased to notice that the article we contributed on March 4 is having the effect we desired in arousing interest and producing other contributions, as we are satisfied that it is only by the fullest thought being concentrated on the subject that gas will secure that pre-eminence in the housing scheme which, undoubtedly, in the national interest it should attain.

To turn to Mr. Dye's communication in your issue for March 25, we will comment as briefly as possible on the points raised.

We intentionally omitted any discussion on the type of stove that should be adopted for the living-room, for the reason that, as Mr. Dye states, it is a matter which requires considerable discussion. To have dealt with it fully would have expanded our already lengthy article beyond the limits we could expect you to allow. The question raised by Mr. Dye, as to whether it shall be an open grate or a kitchen range, cannot, we think, be settled as summarily as he proposes. Evidence that has reached us shows that, at any rate at the present time, it certainly is not the intention to entirely banish coal for cooking purposes. If it is argued that, while a coal-fire is lit for warmth the heat generated should also be used for heating the water—it might well be argued also that while a fire is lit for warmth it should be utilized for cooking.

We quite agree with Mr. Dye that whatever means are adopted for warming the living-room might also heat, or assist to heat, the hot water; and you will remember that we emphasized this point—see paragraph A (1) on p. 447 and paragraph C (2) on p. 449.

Mr. Dye recommends that the circulator and storage tank should be fitted in the living-room, and suggests that the radiated heat would provide all the warmth the room requires, except on very cold days and possibly evenings. We consider that more thought should be given to this proposal before it is claimed as an advantage of the gas-heated circulator. There appear to be other considerations to be taken into account beyond those mentioned by your correspondent. For instance, every unit of heat utilized in warming the room means a unit lost from the heated water and, therefore, greater consumption of gas. To suggest that the gas-heated boiler and storage cylinder give sufficient heat to warm a room is, we think, to lay oneself open to a charge of extravagance rather than economy, as claimed by Mr. Dye. We would prefer to suggest that the cylinder and pipes should be lagged with insulating material in order to reduce the losses by radiation, as mentioned in our article. We must certainly agree with Mr. Dye

that it is very "strange" that, if the method proposed provides suitable warmth in winter, it does not make the living-room excessively warm in summer.

You will notice that your correspondent in paragraph 7 of his letter especially emphasizes the necessity of the "Economy" valve, to prevent waste of gas. Then he discusses in paragraph 8 the adaptation of the storage system to heating the kitchen living-room. To do this work it would be necessary to heat the whole of the cylinder to ensure sufficient radiating surface. The average temperature of the outside atmosphere is 40° Fahr. from October to March—six months. The "Economy" valve would, therefore, be of no use.

Richmond Gas Stove & Meter Co., Ltd.

132, *Queen Victoria Street, E.C.*,
April 5, 1919.

Re "Discontented."

Sir,—I read with much interest your suggestions for a union of gas companies' staffs.

What do you think of this little story? "In August, 1914, a war broke out, and the country appealed for men. There were men who drew equal salaries heard the call; some answered. The same men four years later met in the same gas office. The soldiers have been re-instated at a salary much less than those who stayed at home. Why should those who served their country be compelled to accept less than those who were fortunate enough to remain at home?"

Such conditions demand close investigation and putting right. Wake up gas companies' clerks! When is the first meeting? I'll be there with many comrades, all ex-soldiers. "Squashed."

April 4, 1919.

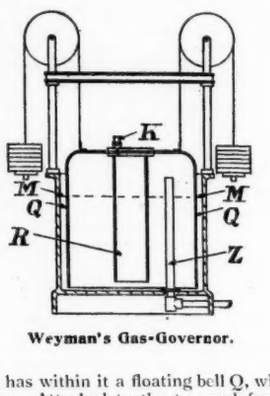
REGISTER OF PATENTS.

Gas Governors or Regulators.—No. 122,966.

Weyman, J. E., of Newcastle-upon-Tyne.

No. 5755; April 4, 1918.

This invention relates to automatically controlling a separate supply of gas by means of, and in proportion to, the pressure of gas in a reservoir or pipe-main.



Weyman's Gas-Governor.

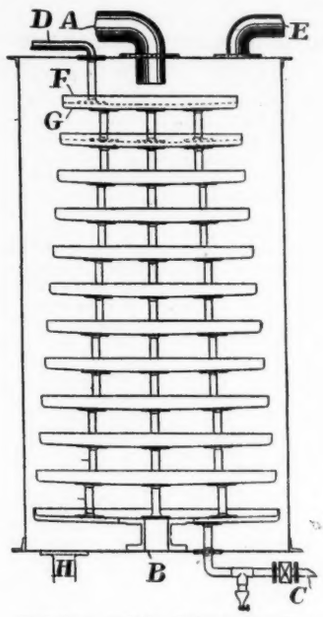
The vessel shown has within it a floating bell Q, with balance weights in the usual manner. Attached to the top and forming part of it is the tube R; while a gas or air pipe Z opens at one end in the top of the bell and is connected at the other end to the gas main or air pressure supply. Upon the bell being filled with water to the level M, the tube R is also filled to the same level by opening the cock K, which is then closed. Upon admitting the gas under pressure through the pipe Z, the pressure tends to raise the bell, carrying with it the tube R, which will by suction take up a column of water forming the seal. The bell will continue to rise until the column of water equals in weight the pressure exerted in the bell; and as the rise of the bell for any given gas pressure will always be in proportion to the difference between the sectional areas of the bell and the tube the movement will always synchronize with that pressure.

Stills or Preheaters for the Dehydration of Tar.—No. 123,163.

Blakeley, W., of Church Fenton.

No. 2646; Feb. 14, 1918.

This still or preheater is formed of a number of horizontal troughs or trays, each comprising a false bottom, through which steam, liquids, or gases may be passed for heating it; each unit tray being connected to trays above and below it, by hollow supports, which form passages for the heating medium. The steam inlet pipe (preferably at the bottom of the still casing) thus communicates directly with the steam chest of the lowest tray; and steam passes through all the trays to a steam outlet pipe. The trays are horizontal and parallel or in cascade pattern—diminishing in width as they approach the roof of the still. Between each pair of trays, steam-pipes may be placed alternately; so that there is no direct blow-through of steam. The overflow of liquid from one tray to another will not be entirely directed from the lips of the tray above; but the overflowing liquid will have a tendency to run along the underside of the tray—coming in contact with the bottom of the steam-heated chest, and thus increasing the efficiency. The still may be heated by furnace gases passed through the chests, and also the casing may be externally heated to increase the efficiency. The tar or other liquid to be treated may be preheated by utilizing it for the condensation of the vapours given off; and the finished product may also be used for the same purpose, as well as for cooling it down to final temperature.



Blakeley's Still for Dehydrating Tar.

A sectional elevation of a still of cascade form is shown. A is the crude tar inlet; B, the dehydrated tar outlet; C, the steam inlet; D, a steam outlet; E, a connection to a condenser; and F the trays, each having a steam chest G. The steam inlet C is connected to the steam chest of the lowest tray, whence steam passes through the stools or pipes supporting the trays to the steam chest of the next superimposed tray, and so on. A drain H is provided for the occasional removal of condensation moisture from the interior of the still. Three steam pipes lead from the lowest steam chest to the next higher one, and three other steam-pipes, spaced out at 60° from those of the first set, lead from the second to the third steam chest, and so on.

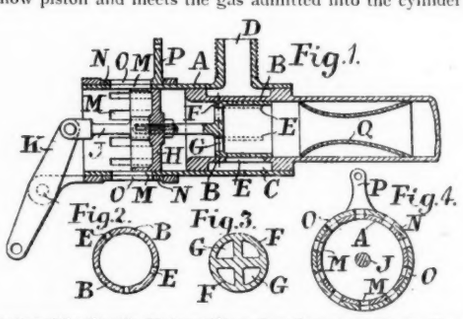
Control for Gas-Driven Vehicles.—No. 123,826.

South Metropolitan Gas Company and Macdonald, R. C., of Old Kent Road, S.E.

No. 4021; March 7, 1918.

This invention has reference to a device directed to the control of gas-driven motors, and to the correct proportioning of the mixture for all engine speeds. It also relates to means for varying the proportion of gas to air to suit varying qualities of gas.

The apparatus comprises a cylindrical casing wherein is contained a cylinder of reduced diameter, so arranged that around it is an annular space, with which a gas inlet communicates, while ports permit the passage of the gas into the interior. The ports are controlled by a hollow piston movable in the cylinder. The cylindrical casing also contains a piston coupled to the piston just mentioned, so that both pistons move together. The second piston controls ports in the circumference of the casing for the admission of air, which passes through the first hollow piston and meets the gas admitted into the cylinder by the



Macdonald's (South Metropolitan Gas Company) Controller for Gas-Driven Vehicles.

latter. The air and gas then enter a choke-tube, where a thorough mixture is effected. As the two pistons are connected, when the first piston uncovers its ports the second piston uncovers its ports to a corresponding extent; and as the ports in the cylinder and in the cylindrical casing are proportioned to give a correct mixture of air and gas, for every opening the proportion is constant. When it is desired to vary the proportion, a shutter embracing the cylindrical casing is operated by a lever so as to cause the covered air-ports to reduce or increase their capacity.

Fig. 1 is a longitudinal section; fig. 2, a cross section detached, of the cylinder of reduced diameter; fig. 3, a cross section of the piston

in it; and fig. 4, a cross section of the cylindrical casing through the air-ports.

A is the cylindrical casing; B, the cylinder of reduced diameter therein; C, the annular space between the cylinder and casing; and D, an inlet for gas opening into the space C. E are ports between this space and the interior of the cylinder. F is a piston controlling the ports E. G are passages through the piston F for admitting air to the interior of B. H is a piston connected adjustably to the piston F by a rod; while a rod attached to the back of the piston H is connected to a lever K by means of which both pistons can be moved together to the required extent. M are air-ports in the casing controlled by the piston H. N is a cylindrical shutter (embracing the casing) about these ports and provided with slots O, which, on the hit-and-miss principle, regulate the area of the ports to admit a volume of air according to requirement. P is a lever for turning the shutter; while Q is a choke-tube in the induction pipe of the engine.

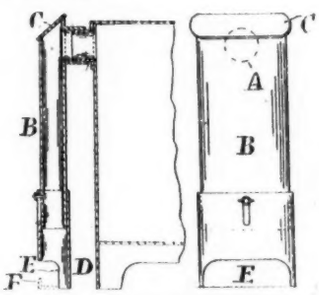
Gas Cooking-Ovens.—No. 123,873.

Allan, A. P., of Scarborough.

No. 6405; April 16, 1918.

This invention has for its object to add to a gas-cooking oven a flue-like device connected to the usual flue outlet of the oven and descending towards the floor—of considerably greater area than that of the outlet, "in order to reduce the velocity of the products escaping from the oven and effect a reduction in their temperature."

The illustration represents a portion of such an oven, and an elevation of the descending flue.



Allan's Gas Cooking-Ovens.

The flue-outlet from the oven comprises a short pipe or elbow A, and on it is fitted a nozzle for the descending flue B. This is of much greater cross sectional area than that of the flue outlet. The descending flue nozzle may be an elbow or a pipe. In the latter case, the top cover C is placed at an angle to deflect the escaping products and so avoid back-pressure. The lower end D of the flue terminates a sufficient distance from the floor to prevent back-pressure at this point also. A portion of the lower end of the flue (away from the oven) may be cut away so as to form a guard or shield at E, and so prevent the products being again drawn into, or towards, the oven. If the flue pipe is made extensible, in order to suit cookers of varying height, the extension piece is so constructed that, when it is fitted on the flue the guard or shield is next to the cooker, so that the products are prevented from being drawn into, or towards, the oven. The lower end of the descending flue or extension piece may also be in the form of a tray F, to collect the small quantity of water which condenses when the flue is cold and the oven burners are lighted.

Ballinrobe Gas-Works Coal Supply.

In the High Court of Ireland, Dublin, Mr. Justice Kenny and Mr. Justice Pinn made absolute a conditional order directing the Ballinrobe (co. Mayo) Urban District Council, and their Trustees (the Bank of Ireland), to pay £721 17s. to Messrs. A. Russell & Co., of Glasgow, for coal supplied for the Council's gas-works.

For Messrs. Russell & Co., Counsel said the case put forward by the Urban Council was that they had no money to pay, but that they were negotiating for the sale of the gas-works; and that as soon as they received the purchase money they would pay. They had since offered to pay the amount, but would not give the interest on the debt.

Trading Departments at Bradford.—The annual abstract of accounts of the Bradford Corporation shows a gross income of the trading undertakings of £1,342,000, and expenses £973,731, leaving a gross profit of £368,269, representing 4·66 p.ct. on the capital expenditure. After payment of interest and contributions to the sinking fund, there is a net deficit of £8172. The gas-works gross profits for the year were £27,347. The net debt per head of the population on the trading undertakings is £17 4s. 9d., and on the non-trading undertakings £11 4s. 5d.—a total of £28 9s. 2d.

Benzol as a Motor Spirit.—At a social gathering of the National Motor Cyclists' Fuel Union, at Leeds, Mr. A. W. Torkington (the Treasurer of the Auto-Cyclists' Union) spoke of the national movement to popularize the use of benzol as a motor spirit. He said that, owing to the public not taking it in the quantities they might do, many of the benzol plants were being dismantled. One of the chief difficulties was the shortage of cans. The Benzol Association had agreed on a standard specification, and had put down £500,000 of capital to purchase tank-wagons, storage tanks, cans, and drums, in order to get the spirit properly on the market, and, to assist, the Government had agreed to withhold the 6d. tax. Mr. Torkington spoke of the advantages of benzol over petrol, giving 20 p.ct. more power, and being better for carburettors.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

The Huddersfield Corporation Gas Bill, the Newark Gas Bill, and the Pembroke Gas Bill, have been referred to the following Select Committee: Lord Kintore (Chairman), Earl Verulam, Lord Greville, Lord Sackville, and Lord Avebury. To meet on Tuesday, May 6.

The Brentford Gas Bill was read the third time, with the amendments, passed, and returned to the Commons.

The Sunderland Gas Bill was reported, with amendments.

HOUSE OF COMMONS.

Progress of Bills.

The Poole Harbour Commissioners withdrew their petition against the Bournemouth Gas and Water Bill.

Sunderland Gas Bill.

This Bill was sent forward for third reading by the Unopposed Bills Committee of the House of Lords last Tuesday. The Bill enables the Company to acquire further lands and to use them for gas purposes, to consolidate the existing capital and convert it into a 6 p.ct. stock, to raise £200,000 new capital with £37,500 borrowing powers, and to legalize the use for gas purposes of certain lands now in possession of the Company. When the Bill was first introduced, there was a permissive power to acquire the undertakings of the South Hylton Gas Light and Coke Company and the Whitburn Gas Company; but definite agreements for the purchase of these undertakings are now scheduled to the Bill. The opposition of the Corporation, which at one time led to the Bill being sent to an Opposed Bills Committee, had been practically settled, though if necessary the right is reserved to oppose in the other House.

Hartlepool Gas and Water Bill.

The Bill promoted by the Hartlepool Gas and Water Company was also sent forward for third reading by the Unopposed Bills Committee of the House of Lords last Tuesday. The measure deals chiefly with the Company's water undertaking. There are, however, a few clauses relating to the gas undertaking, mostly in the nature of the model clauses. Power is taken to manufacture residual products up to the usual one-third percentage.

Profit-Sharing and Co-Partnership Statistics.

Commander Bellairs asked the President of the Board of Trade whether he had any information as to the number of firms or companies, and the number of persons employed, in which profit-sharing was practised for the latest available year as compared with the figures of 62 firms and 73,297 to 79,660 persons for 1909; and how many of these undertakings were gas manufacturers.

Sir R. Horne, who replied, said that the latest complete figures appeared in the "Labour Gazette" for November, 1915, and related to June 30, 1915. At that date there were 153 firms in the United Kingdom (other than co-operative societies) who had some form of profit-sharing or co-partnership in operation. These firms had an average of 141,112 persons in permanent employment during the twelve months preceding the declaration of profits in 1914; while the maximum number of casual employees on any one day was 4892. The number of gas companies included in this total was 41, of which three had since been merged in other profit-sharing gas undertakings, one had been terminated in consequence of the municipalization of the undertaking, and one had been abandoned owing to the dissatisfaction of the workpeople.

Northampton Gas Bill.

This Bill was last Thursday before an Unopposed Bills Committee of the House of Commons presided over by Sir E. Cornwall.

Mr. Cash, Parliamentary Agent, said the main object of the Bill was to substitute new capital powers of £130,000 ordinary shares and £70,000 loan, for the unexhausted capital powers of £67,000 share and £25,000 loan capital.

Lieut.-Col. G. S. Eunson, the Company's Engineer, said they required purifying plant for another 1,000,000 c.ft. This estimate was based solely on the future requirements, and not on the experience of past years. There were at present in Northampton many factories being built, and in recent years many others had been erected, from which a great increase in the consumption of gas for all purposes was looked for. The present output was 3,500,000 c.ft. per day; and the scheme under the Bill would permit of this amount being increased to 6,000,000 c.ft.

The Bill was ordered to be reported for third reading.

Workmen's Compensation and Disabled Men.

Mr. Robert Richardson asked the Secretary of State for the Home Department what arrangements had been made to relieve employers of any increased liability under the Workmen's Compensation Act with respect to the employment of disabled men.

Mr. Shortt replied that the Disabled Sailors and Soldiers Compensation Committee, who reported last year, recommended that certain arrangements should be made with insurance companies and others by which employers would be indemnified against any increased liability under the Workmen's Compensation Act arising from the employment of disabled men. The nature of the arrangements was summarized on pages 7 and 8 of the report. The Government had approved the adoption of arrangements on these lines; and the necessary legislation would be introduced at an early date.

BOURNEMOUTH GAS AND WATER BILL.

House of Commons Committee.—Wednesday, April 2.

(*Sir* Harry Samuel, Chairman, *Colonel* Jackson, *Mr.* Frederick Hall, and *Mr.* Lyle Samuel.)

The Bill, promoted by the Bournemouth Gas and Water Company, proposes to acquire additional land and to use existing lands for gas purposes, and to convert existing, and raise additional, capital.

Counsel for the Bill were: Mr. G. J. Talbot, K.C., Mr. W. J. Clode, K.C., and the Hon. Evan Charteris. The opponents were represented by Sir Lynden Macassey, K.C., and Mr. Tyldesley Jones, for the Poole Corporation; Mr. W. J. Jeeves, for the Bournemouth Corporation; and Mr. Keen for owners and occupiers.

Mr. Talbot said the Bill related mainly to the gas portion of the Company's undertaking. The Company began as a limited company in 1865, were incorporated in 1873, and several later Acts of Parliament extended their powers and area of supply. The original area was confined to Bournemouth. In 1902, however, the undertaking of the Poole Gas Company was acquired; and in 1913 a further extension of area was sanctioned—this latter comprising Christchurch and other districts to the east. The original works of the Company were at Bourne Valley; but they had now practically been discontinued, except as a stand-by. All gas manufacture was now concentrated at Poole, where the works were on a site on the quay to the south of the town; there being good facilities for seaborne as well as railborne coal. In 1903 the Company were authorized to acquire a large area of land a few hundred yards away from the quay site; but not having water carriage facilities, the purifiers for the whole of the gas supply had been erected on this land. The increase in the demand for gas had made an extension of the works absolutely necessary—in fact, an extension was overdue, and there was not the least doubt that the Company would have come to Parliament earlier but for the war. In round figures, the demand had doubled itself between 1907 and 1917. At present, the output was 1200 million c.ft. per annum—a remarkable result when the restrictions of the past few years were remembered. The Company were faced with the fact that the works must be extended; and the question was which was the best site. The only possible extension of the existing Poole works was east or west along the quay. To the west, however, they would be going nearer to the centre of the town, and would have to stop up two roads, as well as acquire and demolish about seventy houses. To the east, they would have to encroach on the foreshore, and interfere with a fisherman's wharf. In either case they would be bound to meet with considerable hostility; and the conclusion had been come to not to extend the works in either of these directions. Consequently, the Company turned to the land acquired in 1903, which was bounded by the South-Western Railway, but had no sea connection. In every other respect it was an excellent site for a gas-works. Already there were erected upon it purifiers and a gasholder; and the Company now proposed to make gas on this land in addition. In order to give the site the advantage of seaborne coal facilities, it was proposed to construct an overhead conveyor, which would carry the coal from the steamers alongside the Quay works into the new works—the distance being about 500 yards. This would avoid having to cart coal through the town, and, besides being more economical, would not create a nuisance in the streets. This transporter would cost £10,000. The position with regard to the land, however, was peculiar. Over a large part of it the Company had unrestricted powers, and could manufacture gas on it. There was one portion, however, which was subject to a proviso to clause 19 of the Act of 1903, which read: "Provided that the Company shall not erect or construct retorts on the lands under the headings F, G, H, and J, in the Schedule to this Act." He was unable to clear up the mystery which attended these words. As he had said, the Company had to-day purifiers at work upon the land in question. They could make residuals and do anything else they pleased in the ordinary course of their business, while the other portion of the land, on which they could actually manufacture gas was close up against the houses in the High Street.

Sir Lynden Macassey said the proviso was inserted by agreement between the Company and the Corporation.

Mr. Talbot said the Bill asked that this proviso should be removed. He submitted that the time had come when the matter should be considered *de novo;* and he asked the Committee to say that the land was a suitable site for the manufacture of gas in the circumstances of to-day. One of the chief objects of the Bill was to make the land covered by the proviso he had mentioned available for the purposes of gas manufacture, and also to be able to utilize the whole site by the construction of the conveyor. In addition, it was asked that powers should be given to extend the land by adding another strip to it. If this were not done, the Company would be compelled to manufacture gas on the part of the land over which they now had full powers, and which was close up to the houses. Another object of the Bill was to lay a new main under the London and South-Western Railway. The Company also wished to acquire lands in conjunction with any town-planning scheme of the Local Authority, in order to provide suitable housing accommodation for their workmen. This was a new departure. It was proposed to convert some of the Company's existing capital. The great bulk of the present capital was maximum dividend capital; but there was a small part subject to the sliding-scale. The sliding-scale capital, which had a standard price of 10 p.ct., amounted to £50,000. It was proposed to convert it to £100,000 of 5 p.ct. stock. Further capital powers were asked for to the extent of £600,000, making, with the usual one-third borrowing powers, £800,000. With the great rise in the price of materials and the uncertainty as to the future in regard to coal, it would be necessary for capital powers to be on a larger scale than hitherto; and from the estimates it would, he thought, be conceded that the capital powers asked for were moderate. The present issued capital of the Company was £548,110, consisting of £115,000 of 6 p.ct. preference shares, £50,000 of 10 p.ct. standard sliding-scale shares, and £383,110 ordinary stock, with 7 p.ct. maximum dividend. In addition, there were £150,000 of 7 p.ct. capital not issued. This, however, was the nominal value of the capital; but it had been issued at a premium, which had brought in an additional £200,000, which went into the funds of the Company, and was not subject to dividend. As to debenture stock, there had been issued £211,900, and there was power to borrow £89,588. Of the debentures, £50,000 were 3 p.ct. and £161,900 were 4 p.ct. Thus, with the unissued capital and the new powers under the Bill, the total capital powers of the Company would be £1,039,000. By clause 26, it was proposed that of the new capital £100,000 should be added to the sliding-scale stock. Another proposal of the Bill was to raise the rate of interest on the 4 p.ct. debentures to 6 p.ct., to bring it into accord with the present value of money. The main opponent to the Bill was the Poole Corporation, with whom the Company had always been on very friendly terms. Objection was taken to the scheme on the ground of some apprehended danger to the town if gas was manufactured on the lands in question. This opposition, however, seemed to overlook one or two cardinal elements in the situation. It assumed that an entirely new works was to be put up, and that there were no works there at present.

The Chairman asked if the portion of land over which the Company had full powers would be large enough for the purpose in view.

Mr. Talbot said it was not so large as the Company wanted; but it could be managed with if they were compelled to do so. In that event, there would have to be a modification of the coal transporter scheme. Another objection was that the existing works were large enough for the needs of Poole. The concentration at Poole, however, had given cheaper gas in the town; and if further extension of the works was to be prevented, then Poole could not benefit in the matter of the price of gas. A considerable proportion of the increase had been in Poole, and not in Bournemouth. Since the acquisition of the Poole Company, the sale of gas in Poole had multiplied by four. In the same period, the demand in Bournemouth had multiplied by two.

Sir Lynden Macassey said he did not press this point.

Mr. Talbot, continuing to deal with the Corporation petition, said objection was also taken to the amount of new capital, and complaint was made that there was no differentiation in the Company's accounts between the gas and water. This, however, was a difficult matter.

The Chairman asked what was the rule with other companies.

Sir Lynden Macassey said it was about half and half.

Mr. Talbot said the Corporation's petition also asked that the standard price of 4s. 6d. should be reconsidered, on the ground that it was too high. He suggested that there were very few instances of the standard price being altered in the way suggested; and the fact that the price of gas had been reduced in the Company's area showed that the sliding-scale had operated successfully.

Sir Lynden Macassey said he would not press this point.

Mr. Talbot finally referred to the objection raised to pressure—the Corporation asking for 2 in. The Bournemouth Corporation petition raised some similar matters to those dealt with in the Poole Corporation's petition, and there was also opposition by property owners.

Mr. *W. Cash*, the Chairman of the Company, said they now supplied gas for a distance of 21 miles along the coast. When the move was made to Poole, there was an immediate gain of 1s. 6d. per ton in the cost of coal, owing to the advantage of water carriage. In the following year, there was a difference of 2s. 7d. per ton. The Bourne Valley site had been abandoned for manufacturing purposes. When the Poole Company was acquired, there was an immediate reduction in the price of gas in Poole of 5d. per 1000 c.ft. When the Christchurch works were taken over in 1914, there was also a considerable reduction in the price of gas. Great developments were now looked for between Bournemouth and Christchurch; most of the land between Bournemouth and Poole having been developed. Since 1917 the demand had increased to such an extent that some money had been spent on putting the Bourne Valley works into a condition to make gas. They would not, however, do this unless they were compelled to, because these works were not economical either in design or situation. The Poole works had been remodelled, and were now quite up to date; there being two vertical retort-houses, and all the plant was electrically driven. As an instance of the value of the sea carriage, witness mentioned that when their own ship, the "Corbet Woodall," was running, the freight was 3s. 6d. per ton. During the war, however, the Company actually paid 30s. per ton. In the past four decades, the consumption of gas in their area had doubled itself. The growth had been far more rapid than he would ever have cared to prophesy.

In reply to the Chairman, witness said the restriction upon the portion of the land for which powers were given in 1903 was part of a bargain with the Corporation. The land was at the time under water. As to the degree of nuisance from the purifiers already on the land and that from gas-making plant, he thought that, from the point of view of smell, there would be less nuisance from the gas-making plant; but there might be greater nuisance from dust. The extension of the works to the west would mean the demolition of seventy houses, a pottery, five shops, and three publichouses. It would also involve the Company providing a scheme for re-housing the population affected. This extension would also mean closing two roads.

Sir Lynden Macassey said he was going to suggest that the extension along the quay to the west would be preferable to what was proposed in the Bill.

Witness said that such a scheme would be found to involve violent opposition from the inhabitants, and he certainly would have thought the Corporation themselves would have opposed. Negotiations had been carried on with the Corporation on the matter; but, broadly speaking, their view was that they objected to the scheme as a whole, and wanted the Company out of Poole altogether. The Company, however, had no other possible site available than the land referred to. They were anxious to do everything possible to meet the Corporation with a view to nothing being done to the detriment of the town. But it must be remembered that the Company were trustees for the consumers and also for their shareholders; and this site was the cheapest of any that had been considered. If the scheme as laid out was completed, the works would be further away from the houses than if the Company were compelled to erect works on the piece of land over which they at present had full powers. The Company now supplied 30,000 consumers.

Asked by the CHAIRMAN for an estimate of the difference between the capital expenditure per million cubic feet before the war and now, witness said it was difficult to say exactly. Before the war it was usual to assume £750 per million; and taking it that the consumption doubled itself in the next ten years, a figure of £900,000 would be arrived at on the basis of pre-war figures. If, for instance, a 60 p.ct. advance was admitted, then the figure of £1,000,000 asked for would be greatly exceeded.

With regard to the question of the standard price, opposition to which the Poole Corporation had withdrawn,

Mr. JEEVES, for the Bournemouth Corporation, said he would ask the Committee to reconsider the present standard price, which was admittedly high. He certainly should ask that the existing standard should not apply to the new capital.

The CHAIRMAN said he did not think the Committee could deal with the general question of a review of the standard price.

Mr. JEEVES said he would have to insist in his opposition to the existing standard being applied to the new capital.

The CHAIRMAN thought Mr. Jeeves was entitled to ask what was a fair price for the new capital.

Witness said he would have to impress upon the Committee the unfairness of any alteration in the existing standard; while a different standard for the new capital would involve complications. It was better to have one standard throughout. Moreover, the dividend paid on the Company's shares had not been extravagant on the whole; and if any revision was to be made, he would ask for it to be in favour of the Company. Speaking of the advantages to the town of Poole by the presence of the Company, he referred to the large rateable value of their property, and to the fact that they paid 33 p.ct. of the Harbour dues.

Mr. JEEVES cross-examined for the Bournemouth Corporation on the question of capital expenditure, and based his questions on pre-war figures.

The CHAIRMAN, interrupting, said the Committee agreed that if the expenditure in the future was on the same scale as pre-war, the amount asked for in the Bill was excessive; but it was for the Committee to decide whether expenditure in the future would be on the same scale as before the war. The Committee would consider this point.

Witness said, with regard to the powers to redeem stock out of revenue, that he would not ask for these if the Local Authorities did not agree. He rather gathered from the petitions that the Local Authorities were in favour, because there were arguments in favour of it. It tended to keep capital down; but if there was any objection on the part of the Local Authorities, he would not ask for these powers.

Mr. JEEVES cross-examined at some length upon the desirability of separating the accounts of the gas and water undertakings.

Witness said that at best the result could only be an estimate, owing to the overlapping of the services of the employees in many branches of the two undertakings. He could not agree that the standard of 4s. 6d. was unduly high, having regard to the pre-war price of gas. He regarded it as fair that 4s. 6d. should be re-established in present circumstances.

Sir LYNDEN MACASSEY, cross-examining as to the use of the lands referred to in the Bill, put it that if the Corporation of Poole were so punctilious that retorts should not be erected on the piece of the land restricted by the Act of 1903, it obviously did not contemplate that the Company would erect retorts on the portion of the land upon which the Company had full powers, although there was no agreement to this effect.

Witness said if that was so, it was remarkable that the Corporation should not have asked for the same restriction over all the land.

Thursday, April 3.

Sir LYNDEN MACASSEY continued his cross-examination to-day. It was put to witness that the Corporation had cleared some land to the west of the present works for the purpose of housing, but had found it unsuitable. The land was now lying vacant; and the remaining houses near were of the same character as those the Corporation had already cleared away. Therefore, said counsel, an extension to the west of the present works was the most natural course to adopt.

Witness replied that there was not only the question of acquiring the property on this site, and the opposition which might be expected, but there was the re-housing of the population elsewhere by the Company. As the law stood to-day, this would have to be done, although the position might be different in the future. Moreover, at the interviews with the Corporation, this site was never proposed. Subject to all the objections he had mentioned, the site would be a good one.

Sir LYNDEN MACASSEY said the view of the Corporation was that the nuisance of the gas-works should be concentrated on the present site, and not spread further.

The CHAIRMAN pointed out that the nuisance, so far as it existed, was already spread, as the purifiers were on the land which it was proposed to use for manufacturing gas.

Mr. KEEN, for owners and occupiers of property in the neighbourhood of the land, put it to witness that a great deal of apprehension had been stirred up among the owners and occupiers by the Company's proposal. A memorial to the Corporation had been signed by 1500 persons; and those immediately concerned alleged that, while they were at present affected by the gas-works, their interests would be still more prejudiced if the proposed scheme went through.

Witness said that if the works were carried out on the suggested land, it would remove any possible nuisance, and the owners and occupiers would be less affected than if the Corporation scheme was adopted.

Mr. KEEN put a number of questions as to the inevitable inconveniences in the neighbourhood of a gas-works, such as dust from coal handling, &c.

The CHAIRMAN said the question was how far human beings should suffer for necessity.

Witness said it was the duty of the Company to mitigate any nuisance; and they had always done so. Considerable expense was incurred to meet objections that had been made against the working of the purifiers.

Mr. KEEN said that the effect of the Company's proposal was that the owners and occupiers whom he represented would be placed practically between two gas-works. If the works were extended towards the town, as suggested by the Corporation, the Company would be coming nearer to the poorest part of the town; while one portion of the new site would give an outlet into the best part of the town.

Questioned as to the transporter, which Mr. Keen said would have to cross two roads, witness said that a railway, instead of a transporter, had been ruled-out by his advisers as practically impossible, owing to the necessity for building an extension of the quay, and the expense involved. The case for the conveyor was that if it was not built, the coal would have to be carted through the streets; and this, he agreed, would be a nuisance.

Replying to the CHAIRMAN, witness said that the case for the Bill was that, as the Company felt it would be a nuisance if gas-retorts were placed on the land on which they now had powers, they asked Parliament for powers to put them further away, on a site where there were practically no houses. Moreover, there were no powers in the present Bill to extend towards the west; and it was not before the Committee. The Company would have to proceed all over again, and it was impossible to say what the opposition would be to such a scheme.

Witness, in the course of his re-examination, said the Company would be prepared to abandon the powers they now had over a portion of the land to erect retorts, and abandon the application for powers to place retorts on part of the land covered by the proviso—leaving the remainder free for the erection of retorts.

Having conferred with the Engineer, witness said that, if this proposal was accepted, he would require the assistance of the Corporation in making the remaining piece of land a little larger, and also in the necessary application to the Board of Trade for powers to erect retorts on the new land. As to the transporter, he was advised that it was essential. It could, however, be carried clear of the houses.

Sir LYNDEN MACASSEY suggested that the retorts should be restricted to the northern part of the land remaining in Mr. Cash's offer; but witness said that he had gone as far as he could. It would simply mean cramping the scheme from the beginning.

The CHAIRMAN at this point suggested that, as there was now not a great deal as regards the land between the parties, the Engineer should be called.

Mr. *P. G. G. Moon*, the Assistant Engineer and General Manager of the Company, was thereupon called to deal with the offer made by Mr. Cash. He agreed with the view of Mr. Cash that to restrict the erection of retorts to the northern end of the land now remaining, according to the offer, would unduly limit the design and lay-out of the new works. He did not feel that he could advise his Directors to accept the suggestion. He also confirmed the view previously expressed that the construction of the transporter would involve a certain amount of dust; but the only alternative plan was to cart the coal by road, which would be done by means of 3-ton motor lorries during a greater portion of the day, or the extension of the quay railway, which would have to be carried over the fishermen's dock. In the latter event, there would necessarily be a considerable amount of shunting, both night and day. He was convinced that the annoyance from either of these alternatives would be greater than that which would be occasioned by the transporter. In the working of the latter, every safeguard would naturally be taken to reduce the annoyance to a minimum.

The parties conferred after the luncheon interval—there had also been a conference at the beginning of the day's proceedings without result—but the Committee were informed that no agreement could be come to.

Witness was then examined at some length on the question of the route of the transporter, with a view to meeting the opposition. It was agreed that the transporter could be carried along the foreshore, but that the route proposed in the Bill was the better and more economical. To carry the transporter along the foreshore would treble the length of the route.

Mr. *Henry Woodall*, Consulting Engineer to the Company, agreed with the view of Mr. Moon.

Sir LYNDEN MACASSEY'S cross-examination as to keeping the retorts on the northern end of the piece of land, full powers over which the Company now offered to limit itself, was cut short by the Chairman, who said the Committee were of opinion that, in making his offer, Mr. Cash had gone a long way to meet the Corporation; and the Committee did not think the Corporation should endeavour to pin the Company down to a smaller area.

The CHAIRMAN eventually announced that the Committee found in favour of the Company in regard to the land. on the lines of Mr. Cash's offer; also as regards the route for the transporter as proposed in the Bill, with an obligation on the Company to see that the buckets were not overfilled, in order to prevent as much dust as possible.

The Committee adjourned until to-morrow (Wednesday).

Wages at Salford.—It was decided at a meeting of the Salford Town Council last Wednesday to appoint a Special Permanent Committee to consider all questions relating to salaries, wages, and bonuses of employees of the Corporation. Alderman F. S. Phillips (the Chairman of the Gas Committee) said it was time they had uniformity, and that questions of wages should be properly dealt with.

Gas-Meter Testing in Glasgow.—Mr. S. B. Langlands (the Inspector of Lighting) has reported to the Magistrates of the City of Glasgow on the work of the Gas-Meter Testing Department for the year 1918. The total number of meters tested was 29,937, and the amount of fees collected £912 15s.—figures which are an increase upon 1917. Of the total number tested, 28,581 were new and repaired meters, and 1356 were sent in by gas consumers for certification as to correctness. Of the new and repaired meters 250 were rejected; and of those sent in by consumers for certification 866 were correct and stamped, and 490 rejected.

MISCELLANEOUS NEWS.

STATE CONTROL OF ELECTRICITY GENERATION.

Nationalization of Plant and Financial Aid Recommended.

The report (dated Oct. 14, 1918) of the Chairmen of the Advisory Council to the Ministry of Reconstruction upon certain administrative aspects of the Electric Power Supply question is now published. The Chairmen of the different sections of the Advisory Council in question constituted an informal Committee, which met each week during the past year to advise the Minister on the most practical methods of approaching the large commercial administrative questions which came before the Ministry to review. They included prominent business men in Sir Henry Birchenough, Messrs. Herbert Gibbs, Lionel Hichens, and Ernest Husey, Sir Clarendon Hyde, and Sir Charles Metcalfe; well-known Labour leaders in Messrs. Bevin and Thomas; and experts in rural and Local Government questions in Messrs. Arthur Allen, Henry Hobhouse, and Leslie Scott.

In the present instance, Dr. Addison laid before the Chairmen a number of Committee reports upon different aspects of the electric power supply question, and asked them to advise whether electric power should be generated on a national system, and, if so, whether current should be supplied at a uniform rate for all areas; whether distribution should be nationally controlled, and, if so, to what extent; and what form of administrative machinery would be appropriate to a national system. The report is signed by Sir Henry Birchenough (the President), Mr. Arthur Allen, Sir Clarendon Hyde, Sir Charles Metcalfe, and Mr. Leslie Scott; and Mr. Lionel Hichens attaches a dissentient memorandum.

The Chairmen were strongly of opinion that electric power should be generated on a national system; but they took the point that the administrative system recommended by the Williamson Committee was too complex (particularly in regard to the methods of finance proposed) to operate with the celerity and uniformity necessary to take advantage of the opportunity of promoting a comprehensive system of electric power supply throughout the United Kingdom on the termination of the war. It seemed to them essential that the creation of large generating stations should be taken in hand at once, and that adequate provision for the development of backward areas, especially having regard to the desirability of increased use of electrical power for agricultural purposes, should be made upon a national scale forthwith. They accordingly came to the conclusion that any efficient system for the development of electrical generation and main line transmission in the United Kingdom must not be only a national system, but a single unified system under State regulation, in the financing of which the State would participate on a large scale. It should, however, be framed and administered throughout upon a definitely commercial basis, and not in any sense upon Civil Service lines. They believed that, upon this footing, it should be possible to supply current in different areas at rates highly favourable to consumers of power in comparison with present rates, and at the same time to provide for interest upon capital for renewals of plant and amortization, and allow of a balance being carried to a reserve fund.

While fully sensible of the necessity of limiting to the utmost extent any further capital commitments of the State, the Chairmen lay stress upon the vital importance of a full development of electric power for productive purposes. They point out that the development of such power in the United Kingdom is at present in its infancy, and that high authorities have estimated at not less than £100,000,000 a year the loss incurred by the nation through failure to take full advantage of electrical progress. On the other hand, the capital value at present invested in electric generation (as distinct from distributing) plant in the United Kingdom does not apparently exceed £45,000,000. Moreover, as most of this represents up-to-date plant, the dead-weight capital for the amortization of which the State would have to provide on taking over all existing plant under a national scheme would not exceed £11,000,000. The Chairmen were therefore strongly in favour of the nationalization of generating plant and the working of such plant in all districts on a national system, though they recognized that it would not be commercially practicable to supply current at a uniform rate in all areas.

As regards distribution, while holding that the State should control main transmission lines, the Chairmen were of opinion that in many cases the Electricity Board (whose constitution is explained below, and who should have full discretion in the matter) would find it convenient to leave distribution in the hands of existing agencies, where such agencies were efficient and progressive. They recommended that the Electricity Board should consist of six members, selected from men of proved business capacity and experience. The chairman should be appointed for a term of five years, and should receive an honorarium sufficient to attract the services of a first-class man, and the remaining members (certain of whom should retire annually) should receive the equivalent of directors' fees on a high scale. Adequate measures should be taken to preserve parliamentary control over the financial operations of the Board; and regulations necessary to ensure that the undertaking is managed with due regard to the interests and requirements of the public should be made by the responsible Government Department.

The first duty of the Electricity Board would be to plan-out a comprehensive scheme for the whole country, and by degrees to secure the development of electrical power over the whole of the United Kingdom by such methods as they might find suitable to the requirements of different areas. In order to give effect to their schemes, they should be empowered to create an "Operating Executive," to which full executive authority and responsibility for the technical management of the scheme or schemes should be entrusted. The men appointed should have the highest qualifications from the technical and business point of view, with salaries (or salaries supplemented by commissions) appropriate to the necessary standard of practical experience. Proper capital and profit and loss accounts should be kept. The staff should be, in all its branches, organized upon commercial, and not upon Civil Service, lines. The Operating Executive would no doubt appoint a manager and staff for each area or central station; and it is to the emulation between these managers that they would look for that stimulating rivalry and competition which is generally absent from undertakings of public bodies.

The Chairmen concluded by saying: We are fully alive to the intricacies of the subject and to the practical difficulties of putting into operation any comprehensive scheme on the lines which we have indicated; but we think that these difficulties can, and will, be overcome by intelligent co-operation between the State authority and the various sections of the community concerned.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

Half-Yearly General Meeting.

The Ordinary Half-Yearly General Meeting of the Company was held at the Offices, D'Olier Street, Dublin, on March 27. In the absence of Mr. John Murphy, whose illness was much regretted, Mr. John E. Fottrell occupied the chair.

The Chairman, in opening, alluded in sympathetic terms to Mr. Murphy's absence, and expressed a hope that they would soon have him with them again to give them the benefit of his good advice and wide experience. In moving the adoption of the report (noticed in the "Journal" last week, p. 650) and statement of accounts, he said the views he would put before them had been drawn up by the Chairman, and had, of course, the unanimous assent of the Board. The figures were not, perhaps, so good as those submitted at the last half-yearly meeting; yet he hoped, when they gave them consideration, and realized the exceptional difficulties under which the working of the Company was carried on during the half year, they might be regarded as satisfactory. There had been an increase in the quantity of gas sold to prepayment consumers, although the consumption for public lighting was again considerably down. The gas sold under the latter head only amounted now to 20 p.ct., or one-fifth of the public lighting consumption both immediately before and at the beginning of the war. On account of the restrictions, the capital expenditure only amounted to £310, although the credits remained about the same figure, and totalled £4507. They had, therefore, again reduced their expenditure on capital account by the sum of £4197. On turning to the revenue account, the profit for the half year, notwithstanding the increase in the price of gas, showed a decrease of £3158 as compared with the corresponding period; but practically every item of expenditure showed a substantial increase. The cost of coal and oil had advanced considerably in comparison with a year ago. It would be seen that, under this heading alone, the expenditure was larger by no less than £24,004, and represented a cumulative increase, because, as mentioned this time last year, expenditure then under this head was higher than in 1916 by £17,946, and in 1916 it was higher than the previous year by £18,805. In other words, the cost of coal and oil for the half year ended Dec. 31, 1914, amounted to £57,175, whereas for the half year ended Dec. 31, 1918, it amounted to £130,384—or an increase of 128 p.ct. Against this large increase of £24,000, receipts from coke and breeze advanced by only £7326, and the income from tar was up only to the extent of £714, while the credit for ammoniacal liquor and sulphate remained the same. This meant that they had recovered only one-third of the additional cost. Owing to obtaining a better price for spent oxide, purification was actually a credit on this occasion, amounting to £208, as against a charge in the corresponding period of £330. The charge for repairs and maintenance or works showed an increase of £5568, in consequence of the higher cost of materials. A small increase might also be observed under the head of salaries and carbonizing wages. The total expenditure on distribution (after allowing for the profit on sales of gas-fittings) amounted to £29,022—an increase on the corresponding half year of £5200. This was principally accounted for by the extra cost incurred in repairing and renewing their mains on the one hand, and, on the other, by the substantial curtailment of sales of gas apparatus in order to meet the wishes of the Coal Controller's representative in Ireland. In connection with the lighting and maintenance of the public lamps, a small profit had again been realized, amounting in the half year to £367. The charges for rent, rates, and taxes showed a substantial increase of upwards of £1700, occasioned by the increase in the rates. The cost of management had slightly increased; while miscellaneous and special charges showed an advance of upwards of £11,000. This was almost wholly explained by the large addition to the war bonus granted to employees during the half year, which had amounted to no less than £10,835, as compared with the corresponding period. Turning to the other side of the revenue account, it would be seen that the receipts for gas sold to ordinary and prepayment consumers were higher by £38,000, of which about £33,500 was due to the increase in price, and £4500 to increased consumption. The income obtained from the sales of gas for public lighting was disappointing, and showed a reduction of £1743. The amount received for rental of prepayment meters and stoves indicated a further advance of £1151, which was considered satisfactory. Passing on to the net revenue account, while the interest paid on temporary loans was less by almost £600, yet the profit for the half year, after allowing for interest charges, was insufficient to meet the larger dividend of £3 6s. 3d. p.ct. (which the Board of Trade could authorize them to pay) without encroaching on the carry-forward brought from the last account. It was a matter of considerable regret to the Directors that, although they applied to the Board of Trade for permission to pay the increased dividend of £3 6s. 3d. p.ct. prior to the last meeting, they had not yet received it, and were, therefore, unable to declare a higher dividend than £2 17s. 6d. p.ct. on this occasion. But the Directors trusted that the order asked for would eventually be made, and that they would be empowered to adjust and pay the

difference on the next occasion. Their position in connection with coal had been steadily getting worse. They had in stock on Sept. 20, 1918, 20,205 tons, and, notwithstanding all their sustained efforts to maintain it, this accumulation had been reduced to 6795 tons now, of which 2795 tons only might be regarded as coal suitable for gas-making purposes. The explanation lay in the fact that from time to time, and even at critical periods, they had been compelled by the Coal Controller to send large consignments of their coal to other destinations. Moreover, their steamers were diverted and utilized to load cargoes for other parties. It would be noticed that their several funds showed an increase of £4000 compared with a year ago. This was principally due to a contribution placed to the special purposes fund last half year. The bank overdrafts, after allowing for credit balances, showed a marked diminution of almost £27,000; while the amount due to sundry creditors was larger only by about half this amount. The value of their stocks was higher by £6000, and the accounts due to the Company were up to the extent of £14,000—the latter being almost entirely due to the heavier accounts occasioned by the advances in prices. Since the close of the half year, the Directors had installed a new stoking machine at the City works; and this apparatus was now in operation and giving satisfaction. The work in connection with the renewal of a battery of ovens had again been entrusted to Messrs. Drakes, Ltd., of Halifax; and, in view of the easier position in regard to steelwork, advantage was now being taken to renew one battery of retort-stack mountings. The Directors proposed introducing the vertical system of carbonizing at the City works.

Mr. A. Bond, in seconding the motion, made feeling reference to Mr. Murphy's illness, and paid a tribute to his work and to his kindly relationship with his colleagues on the Board.

The motion was passed.

On the motion of the Acting Chairman, seconded by Mr. F. J. Dickens, the maximum statutory dividend of £2 17s. 6d. p.ct. was declared.

Proposed by the Acting Chairman, seconded by Mr. J. L. Scallan, the retiring Directors were re-elected.

Moved by Mr. Kelly, and seconded by Mr. G. W. Norman, Mr. Wm. Cash, F.C.A., was re-elected Auditor.

A vote of thanks was accorded the Directors and staff, and acknowledged by Mr. Fottrell.

DEVON GAS ASSOCIATION, LTD.

The Thirteenth Annual Meeting of the Association was held in Exeter on Monday last week.

The Chairman (Alderman F. Templer Depree), in moving the adoption of the report, said the general situation as regards gas undertakings was never in a greater state of uncertainty, and, in reviewing the past year, it was rather remarkable that in so many respects all previous records had been beaten. Every item on the debit side of the revenue account showed an increase. Coal had cost £333 more, although as a matter of fact precisely the same tonnage as the previous year had been used. Wages were considerably increased. Turning to the credit side, the revenue from gas sales showed a net increase of £1167, which was a satisfactory set-off against the heavy expenditure. The additional price of coal must sooner or later inevitably be passed on to the gas consumer; and from a commercial standpoint the delay in realizing this elementary fact by many small and some large gas companies was the cause of many unsatisfactory balance-sheets at the present time. The whole problem of gas manufacture and supply was at present in a complete state of flux. War conditions had brought home the possibilities of gas in which good calorific efficiency was the main essential, and illuminating power a secondary consideration. In fact, the supply in the future would appear to be rapidly pointing to the supply of practically blue water gas. This would entail a considerable readjustment of burners, stoves, &c., and would take time to bring to perfection—in much the same degree as the transfer from the old flat-flame burners to incandescent lighting. But the change seemed inevitable. It might possibly restrict the use of gas in some directions, but would tend to increase it in many others hitherto untapped. Such a change would lead to enormous coal economy and enable gas companies to keep the price of gas at a reasonable figure. The Rew steaming process was the direct outcome of this modern development; and so far as it applied to small gas undertakings, the Association might fairly claim to be among the successful pioneers.

Mr. R. J. Rew (a Director), in seconding the adoption of the report, agreed with the Chairman that there were many causes for congratulation on the past year's working. Compared with the results of many other small companies, those of the Association were most flourishing. They were fortunate in having their works in first-class order at pre-war cost, as future developments must of necessity be very much restricted. The progress of the Association was shown by the fact that the revenue had increased three-and-a-half times in the past ten years. They had nearly 1500 consumers. The adoption of the steaming process mentioned by the Chairman had resulted in great economy of coal. Although it had only been in active operation at three of their seven works for six months, the results were reflected in the balance-sheet. For instance, they had made and sold 2 million cubic feet more gas from precisely the same tonnage of coal than was the case in the previous year. About 175 tons of coal had been thus saved. Had this not been the case, some of the works would have had on several occasions to have closed-down. One or two other technical points would perhaps be of interest. The leakage was the lowest on record, at 9 p.ct. He mentioned this as it had often been suggested that the steaming process might lead to condensation in the town mains. Another fact was that their coke saved for sale remained practically the same as the previous year—due perhaps to more economical furnace working, but still proving from a practical standpoint that the loss of coke per ton of coal (due to the adoption of the steaming process) was not what might theoretically be expected. The production of ammoniacal liquor had remained practically stationary in both quantity and quality, because they did not steam through the coal charge. Any marked increase in liquor would be an intolerable nuisance, as they had to send it a hundred miles to the chemical works. Steaming horizontals had been described as an imperfect method of water gas production; but, with a "trough" retort, it was much nearer perfection than most people imagined. The water gas produced by this means had been described by "outside critics" as doubtful; but there was very little doubt about it, while their carbonic acid content remained at 5 p.ct. Over fifty gas engineers had visited their works to inspect their methods of manufacture; forty of them had adopted it, after seeing it in work; and a hundred and fifty altogether had taken it up for at least a trial. He concluded by expressing their appreciation of the assistance that had been rendered to them by Messrs. Willey & Co., who were always pleased to co-operate in any project which might be of assistance to the gas industry, and particularly to help the small companies.

Mr. W. Cash (another Director), in proposing a dividend of 5 p.ct. per annum, less income-tax, said that, in doing this, he thought they might congratulate themselves on the result of the past year, and was sure the figures in connection with Mr. Rew's steaming process would be regarded as of great interest to the industry as a whole. No one could accuse the Association of profiteering; but they were enabled this year to do what some other companies had not been able to—to pay the usual dividend, put a fair sum to the reserve fund, and carry forward more than the previous year, after making proper provision for depreciation.

Before the proceedings ended, Mr. Rew was re-elected a Director, and Mr. H. A. Plumb, Auditor.

MR. MAURICE GRAHAM'S NEW WORK.

Some Notes of What He Has Done.

As stated in our "Personal" column to-day, Mr. Maurice Graham has been appointed by the Anglo-Persian Oil Company, Ltd. (with whom the Admiralty are closely allied financially), as Consulting Engineer for the construction of a large oil-refinery near Swansea. The site area ranges over 2 miles, and extends to the docks. The scheme includes railways, jetty, power houses, process units of plant, reservoir, tank-farm, &c.

Mr. Graham's work as an engineer in the gas world was always one of great activity; and his services were in demand by the Government in the early part of the war. It is not forgotten that he received his engineering training in the construction of gas-works and recovery plant under the Dempsters, which gave him a good foundation in civil and mechanical engineering upon which to build his career. He was Chief Engineer to the Inclined Retort Company in 1892, and erected both the Coze and the Revised Systems. His book on carbonization, entitled the "Construction of Regenerative Furnaces," was soon out of print. His engineering work as Messrs. Graham, Morton, & Co. (gas-works construction) became world-wide; and he branched out into colliery work, railway bridge building, &c., undertaking all and sundry subsidiary schemes. His study and improvement in the methods of handling and transporting materials by machinery ranged from port equipment for discharging ships to the carrying of any class of material. Again, his travels round the globe furnished him with a fund of engineering knowledge which few have the opportunity of gaining.

In the early days of the Ministry of Munitions, in the year 1915, Mr. Graham was appointed by Sir Frederick Black, and built and equipped the first large gun ammunition ordnance stores and fuse shop at Plymouth. The progress made brought him into touch with Sir Eric Geddes, who appointed him Director of Construction of the national shell-filling factory depôts (some fifteen in number), with full responsibility in design, construction, and erection of this pioneer work for the Ministry of Munitions—with which Mr. Lloyd George was so intimately connected. These factories began producing in less than seven months. They averaged in area of land occupied 1000 acres each. Sir S. H. Lever, the Assistant Financial Secretary, Ministry of Munitions, then secured his services for controlling constructional financial expenditures.

When the submarine menace became acute, Sir Joseph Maclay requisitioned Mr. Graham to take over the full responsibility as Construction Engineer, Ports Branch, Ministry of Shipping, to provide emergency ports storage and equipment to cope with the shortage of ship tonnage, and by this means obtain quicker turn-round of ships. The convoy system further accentuated the necessity for the quicker release of ships, so as to prevent demurrage on the ones already discharged. The national reserve of wheat being of vital importance, Mr. Graham received instructions to build with all speed at the ports for the Royal Wheat Commission, the national war emergency granaries, and to equip them with pneumatic suction plants and conveying machinery. The capacity of these granaries was equal to some 2½ million quarters of wheat. Besides this port work, he undertook and carried out the War Cabinet Scheme, known as the East to West Coast Railway Diversion, designed to cope with the threatened danger to the Channel Ports. He made an inspection of the French and Belgian ports, and entered Ostend, Zeebrugge, and Bruges immediately on their evacuation by the enemy—reporting upon the possibility of their being used for shipping.

When the armistice came, Mr. Graham decided to take up practice as a consulting engineer, and resigned his Government positions—retaining them, however, in an honorary capacity as Construction Engineer to the Ministry of Shipping, Consulting Engineer to the Royal Wheat Commission (Lord Crawford, Chairman), and Consulting Engineer to the Port and Transit Executive Committee (Sir Norman Hill, Chairman). He also remains a member of several Government Committees, upon which he assiduously worked during the war.

STOCKPORT GAS UNDERTAKING.

Expert's Recommendations.

Mr. W. Doig Gibb, who was recently asked to investigate and report upon the working and organization of the Stockport Corporation gas undertaking, has now reported at length to the Gas Committee; and, as the result of his recommendations, the Committee have resolved: (1) That the Gas Engineer (Mr. S. Meunier) be instructed to prepare a scheme for a new carbonizing plant, and that he obtain statistics of the working of vertical retorts for the past four or five years, with estimates of the cost of installation. (2) That steps be taken to secure the services of a foreman to take charge of the carbonizing plant. (3) That a Special Sub-Committee be appointed to interview the Gas Engineer and the Assistant Gas Engineer. (4) That an Accountant should be appointed.

Mr. Doig Gibb says the failure to maintain the prosperity of past years is due to war conditions, principally: (1) Increase in cost of coal, oil, and all other materials. (2) Increase in cost of labour, want of labour, less efficient labour when procurable at all, and bad time-keeping of labour, especially in the retort-house. (3) Poorer working results in output of the retort-house, both in make of gas per mouthpiece (or retort), and per ton of coal. (4) A consequent necessity to make a larger quantity of carburetted water gas. (5) Decrease in quantity of gas sold per annum. (6) Increase in unaccounted-for gas. The working results in the retort-house have been falling to a serious extent. The make has fallen, per ton of coal, from 12,446 c.ft. in 1913 to 10,701 c.ft. in 1918. The increasingly poorer quality of coal (due to larger percentages of contained impurities) explains this to a great extent; but another factor has been the inability to maintain sufficiently high heats in the retorts. The make of gas per mouthpiece has also been much lower. Again the poor coal has been the principal factor; but the low heats also affect it, since either less coal could be properly carbonized or more coal was not properly carbonized. Either condition meant the employment of a greater number of retorts, with increased costs for labour for retorts and furnaces, and for coke consumed. In consequence of the retorts giving a less make per mouthpiece, a greater proportion of carburetted water gas was required than would otherwise have been the case. This cost more than coal gas, in the approximate ratio of 33 to 20 in 1918. To show the influence of varying prices, this ratio, in 1914, was 26 to 20. A decrease in the quantity of gas sold per annum is not without its effect on the available profits. The decrease increases the cost per 1000 c.ft. of gas sold for interest, sinking fund, and standing charges, all of which remain more or less stationary. The decrease in annual consumption, as between 1918 and 1913, amounted to over 9 p.ct. The decrease experienced was not an unusual one; but it was influenced by them having had to reduce pressures at crucial periods. The increase in unaccounted-for gas (from 5·65 p.ct. in 1914 to 10·05 p.ct. in 1918) must, in his opinion, be largely due to incorrect registration of consumers' meters. This has been the usual experience. New meters could not be obtained, and repaired spare meters were not available in sufficient quantity.

While deprecating any detailed comparison with the working results of other gas undertakings, Mr. Doig Gibb states that the Stockport results in the war years compare unfavourably with the majority of them; but, after careful study, he is able to state most emphatically that this is through no fault of the Committee or of the Engineer. He proceeds: Why do the results compare unfavourably? In answering, I do not refer to large undertakings having more than one works, or even to works where there is more than one retort-house. There are many undertakings which, like yours, have one works and one retort-house. (I need only refer to the retort-house, as this is the dominating factor.) The policy of such undertakings, and the proper one, is to put their retort-house in thorough order and up-to-date condition once in every cycle of years, and work it till it either becomes past repair, or till newer and more economical methods justify the scrapping of the existing plant. The determining period of such a cycle is not co-incident in all gas-works. You were unfortunate in this respect. You had decided just previous to the outbreak of war that the time had arrived when a new cycle should be entered into, in consequence of your existing retort-house having become obsolete and too expensive to work (both in results from material and working costs), when compared with more modern methods. You had inspected new plant, and were considering the whole question. When war was declared, you could not go further. I can say so with certainty, as I was the Technical Adviser to the Government in gas-works applications. Their policy was that gas-works must carry on with the plant which they had, and that new and improved plant could not be erected to replace the old (if this was workable) at the cost of delaying other new work of urgent national importance. You have only to consider the difference between your own case and any other undertaking that had just completed new plant before war broke out, to conceive the vast difference which it has made. No one knew that war was coming, or dreamt of the weary years to be occupied by it. Bad luck, and not bad management, has caused you to run an obsolete plant through all these years. Nor could it be kept in reasonable repair and condition, owing to lack of labour. A newer plant would not have required so much labour to work it. Then, again, your 1914 costs for material and high working costs have not only been carried forward throughout the war years, but they have increased to an enormous extent; and your results from material have steadily fallen as your retort-house got more and more out of repair.

Your Committee, Mr. Doig Gibb goes on, may well say: "Allowing all this, has the management done all it could do to combat the unfortunate situation?" On the whole, I can answer in the affirmative. Your Engineer, from my investigations and inspection of drawings, statistics, &c., has done much good work, and he is known to be a keen buyer and an acute seller. I believe, however, that he has sometimes erred in considering cheapness before efficiency. I have had the unique experience of studying your Engineer's hours of office work, for he has "booked himself in and out" through the same machine as records the movements of his subordinates. He has kept long hours; and by those who know his energy, it can be believed that he has done much useful and strenuous work. I am, however, of opinion that even in this there has been an error of judgment. He has probably kept too much to himself, and has not acquired and trained such assistants as would, through their knowledge of affairs, have been of material help to him. In short, he has done too much himself, and should rather have seen that others did more. In consequence, he has loaded himself with details, and has had, perforce, to manage on more or less "rule-of-thumb" lines, because he had no time, nor assistants, to enable him to take a broader view of things. This is not the fault of your Committee, because I understand from Mr. Meunier that you have always endeavoured to carry out his suggestions. With a strong man, before the war, such conditions were not impossible, though impolitic. When war conditions came along, they became impossible. On the top of all his self-imposed duties came many new, intricate, and worrying problems. There was no organization to deal efficiently with them and with routine questions. One result only need be quoted. The heats in the retort-house have been going back steadily; and the make of gas per ton has fallen in consequence. The house is in bad condition; but the heats and the makes were much improved between my first and second visits. This is in consequence of your Engineer's personal and constant attention to the dampers of the furnaces. It should not be necessary for him to do such work, important though it is, and probably not have time to attend to other affairs which he alone can do. I have felt it my duty to say all this, not in depreciation of your Engineer's known ability, but from a desire to see him have more time to devote to what I may term "the affairs of state." The links in the chain between your Engineer and your workmen do not seem to fit well, and though there may be long service, recognized positions, &c., to be considered, I am of opinion that your Engineer would be well advised to reorganize the works staff, clearly define their duties, stamp-out petty jealousies, and create more harmonious working. Competent assistance would relieve him of much routine work, and enable him to keep a more thorough grasp on the whole business. Such an arrangement would pay. I do not desire to have it understood that I am severely criticizing either your Committee or your Engineer in this matter. The war caused you to lose many of your regular employees. It has been difficult to carry on at all, and impossible to do so perfectly. The time is coming, however, when "your house can be put in order."

Mr. Doig Gibb recommends the appointment of an Accountant to take charge of all the clerical work, and then makes the following remarks on the retort-house: This was erected at a period when there were great differences of opinion as to the system which had come to stay. Horizontal retorts with machinery were doing good work, inclined retorts had many adherents, and vertical retorts were beyond the experimental stage. I am not disposed to criticize Mr. Meunier's judgment in selecting the inclined retort system, though it may be quoted against me that I never believed in this system. This, however, was because of my experience that only certain coals worked well in them (and I was speaking of Durham coals), and my consequent fear that a limited and inflated coal market might be the result. I believe, however, that your Engineer placed too much weight on "working in" the existing retort-house walls, and that it would have been better to have laid down the orthodox design of settings, and alter the containing house to suit. His designs for the settings are ingenious; but the plant is cramped, and the working conditions, as regards cost, not ideal. The furnaces were, necessarily, cut down to the available limited space within the existing walls. They were sufficient in the days of good coal and consequent good coke, when in good repair, and when the dampers were properly regulated, to give good results, as is evidenced by the make of 12,466 c.ft. of gas per ton in 1912-13. There was not, however, sufficient margin of heating power; and now, in bad repair, and with poorer coal and coke, it is with the utmost difficulty that the heats can be maintained. And it is questionable if these could be maintained if the former weight of coal per retort were carbonized for any length of time. One furnace heats what are practically two settings of retorts. It is this required balancing of a common heat between two settings which makes it all the more difficult to regulate the dampers. It is a much easier task to consider "sufficient margin" now than in the days which had normal conditions. Even then, however, it was cut too fine. The unfortunate result of the state of the retort-house, the poor coal handled, and the want of labour, has been a shortage of gas at critical periods. This has meant reductions in the pressure of the gas supplied, due to a proper desire to cut down consumption and prevent the gas-holders from being entirely emptied.

He recommends the provision of new carbonizing plant on the site of the present retort-house, and after dealing briefly with several other matters, concludes: No blame can be attached to your Committee or to your Engineer for the condition of your works and the consumers' meters during the war and now, which condition has been unavoidable, and has resulted in the present financial situation. The situation might have been slightly improved by greater co-operation between members of the works staff. There is a pressing necessity for modernizing your carbonizing system. The prosperity of your undertaking can be increased by relieving your Engineer of detail work, and so affording him more time to devote to the greater questions. Though old time prosperity need not be looked for till a new retort-house is in action, there will be an improvement on the existing state of things when prices become more normal, and there is a sufficiency of efficient and peaceful labour. Results will be improved by the cleaner coal which it is hoped may soon be procurable; and these results will be helped by more thorough repairs to the existing retort-bench, and by maintaining a constant and intelligent attention to the dampers.

Retford Gas Prices.—The Retford Town Council have decided to increase the price of gas 6d. per 1000 c.ft., making the charge now 3s. 10d., less 5 p.ct. It was stated that, but for increased efficiency in working, the advance would have been made much earlier. Per ton of coal they were now obtaining 11,500 c.ft. of gas, against 10,000 c.ft. before. This, it was urged, reflected great credit on the new Manager (Mr. J. R. Bradshaw).

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *April 7.*

Business in the London tar products market remains quiet. Pitch is steady at not below 65s. per ton net; there still being a fair amount of inquiry for the present season. Buyers are also interested in business for the next season. Benzol still continues in good demand as a motor spirit; but other tar spirits are quiet. Solvent naphtha is called at about 2s. 6d. per gallon, and toluol from 2s. 9d. to 3s. per gallon.

In sulphate of ammonia, there is nothing new to report.

Tar Products in the Provinces.

April 7.

The average values for gas-works products during the week were: Gas-works coal tar, 34s. 9d. to 39s. 9d. Pitch, East Coast, 50s. to 51s. per ton f.a.s.; West Coast—Manchester 42s. 6d. to 45s.; Liverpool, 45s. to 46s., Clyde, 46s. nominal. Benzol 90 p.ct., North, 1s. 10d. to 1s. 11d.; 50-90 p.ct., naked, North, 1s. 9d. to 1s. 11d. Toluol, naked, North, 2s. to 2s. 3d. nominal. Coal tar crude naphtha in bulk North, 8d. to 8½d. Solvent naphtha, naked, North, 2s. 2d. to 2s. 4d. Heavy naphtha, North, 2s. 8d. to 2s. 10d. Creosote, in bulk, North, salty, 4½d. to 5d.; ordinary liquid, 5d. to 5½d. Heavy oils, in bulk, North, 6d. to 6½d. Carbolic acid, 60 p.ct. unsaleable. Naphthalene, £25 to £30; salt, £6 to £7, bags included. Anthracene, "A" quality, 6d. to 7d. per minimum 40 p.ct.; "B" quality, 2d.

FROM A MARKET CORRESPONDENT.

Tar Products.

Conditions in the tar products markets have undergone no material change since last report. London pitch remains without alteration, and Provincial rates are still inclined to harden, although West Coast centres—particularly Manchester—are still lower than elsewhere. On the East Coast, rates have been up to 52s. per ton; but even if railway transport were available, it would hardly pay to send pitch from the west. The probabilities are that higher prices are coming shortly, when the road-making demand begins in earnest. Creosote exhibits strength; but carbolic acid remains in the doldrums. There is some talk of fixing the price of crude 60's at 11d. or 1s. per gallon; but it cannot be made at the figure. The only cure for present ills seems to be to reduce outputs until demand improves. The position in crystal is made more difficult by the heavy stocks of manufacturers who bought crudes at former high rates. These people are facing a serious loss, seeing that crystal is now worth no more than 4½d. per lb. Naphthalenes are on the down-grade; the demand having almost vanished of late. Solvent naphtha is still awaiting a lead from the rubber industry; and although 2s. 3d. is returned as a Provincial average, it is probable that a lower offer would be accepted. Heavy naphtha and crude are dull. Toluol is easy; and benzol prices have not changed. There is a very good demand for the latter from the motoring and aviation interests, and many users prefer it to petrol—apart from the question of cost. Aniline oil and anthracene are steady. Other products are without feature.

The range of home quotations is as follows:

Benzol: 90% London, 2s. 1d. to 2s. 3d. per gallon; 50-90%, 1s. 11d. to 2s. 2d. per gallon.

Carbolic Acid: Crude 60's unsaleable; crystals, 40%, 4d. per lb. asked.

Crude Tar: London, 40s. to 41s.; Midlands, 34s. to 36s.; North 35s. per ton *ex* works.

Pitch: London, 65s. to 70s. per ton; East Coast, 49s. to 52s. per ton; West Coast, 45s. to 47s., with Manchester 45s. per ton and Glasgow 47s. 6d. per ton; South Wales, 53s. per ton.

Solvent Naphtha: London, 2s. 6d. to 2s. 8d. Provinces average 2s. 3d. per gallon.

Crude Naphtha: Naked, 10d. per gallon.

Heavy Naphtha: 2s. 8d. per gallon.

Naphthalene: Refined, £20 to £22 per ton nominal; crude, £5 10s. to £10, according to quality.

Toluol: Naked, 2s. 1d. to 2s. 3d. per gallon nominal.

Creosote: London, 7½d.; North, 6¾d. to 7d.; heavy oil, 7d. per gallon in bulk.

Anthracene: 40-45%, 4½d. to 8d. per unit per cwt.

Grease Oils: 18° Tw. (naked), £6 per ton f.o.r. makers' works.

Aniline Oil: 1s. 2d. per lb.

Cresylic Acid: 95%, 2s. 9d. to 3s.; 97-99%, 3s. to 3s. 3d. *ex* works London; f.o.b. other ports.

Sulphate of Ammonia.

Conditions remain practically without alteration. Several points regarding the working of the proposed British Sulphate of Ammonia Corporation have been elucidated as a result of a meeting of manufacturers held last week. It now appears that the proposed capital of half-a-million can be materially reduced, and any member is to have the right to withdraw after a period of two years. Further, it is not intended to disregard the usual exporters, and a fixed commission is to be paid for transacting overseas business. Makers claim that this feature must be a regulation of the new organization, impossible of alteration without a three-quarter majority. Second thoughts have produced better views regarding the scheme as a whole; but manufacturers are not prepared to commit themselves without further close consideration, and are not going to be hustled into a hasty decision upon so important a subject.

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Price of Gas at Hastings.

In a notice to the consumers, Mr. C. F. Botley, the Engineer and General Manager of the Hastings and St. Leonards Gas Company, says that, in the present unsettled conditions in the industrial world a further increase in the price of gas, to date from the March readings of the meters, appears inevitable. At this period after the armistice, any further increase in price is contrary to the confident hope and expectation previously prevailing, and is to be regretted in the interests of the consumers, the shareholders, and the whole community. Comparisons, in circumstances arising from the war, between one gas undertaking and another are invidious; but it is fair to point out that the present price of gas here, 4s. 4½d. per 1000 c.ft., is practically the same as that of most of the London companies, and compares favourably with other undertakings similarly affected. Though consumers and the public will be aware of many current conditions affecting the price of gas, it is desirable to give the following information: The cost of labour has advanced enormously, and now, allowing for the reinstatement of employees who have been away on service, is double that of pre-war days. Coal is costing at the pit-head more than double what it did in 1914; and there is every probability of an increase. Freightage of sea-borne coal is three times as expensive; and an increase in railway rates is to be feared. Oil, though recently reduced, is still three times pre-war price; and in regard to stores and material, the cost is double or treble. Increased prices are being received for some residuals, but not in the same proportion to the great increase in the price of coal, &c. A definite announcement will be made as soon as the position can be more accurately gauged.

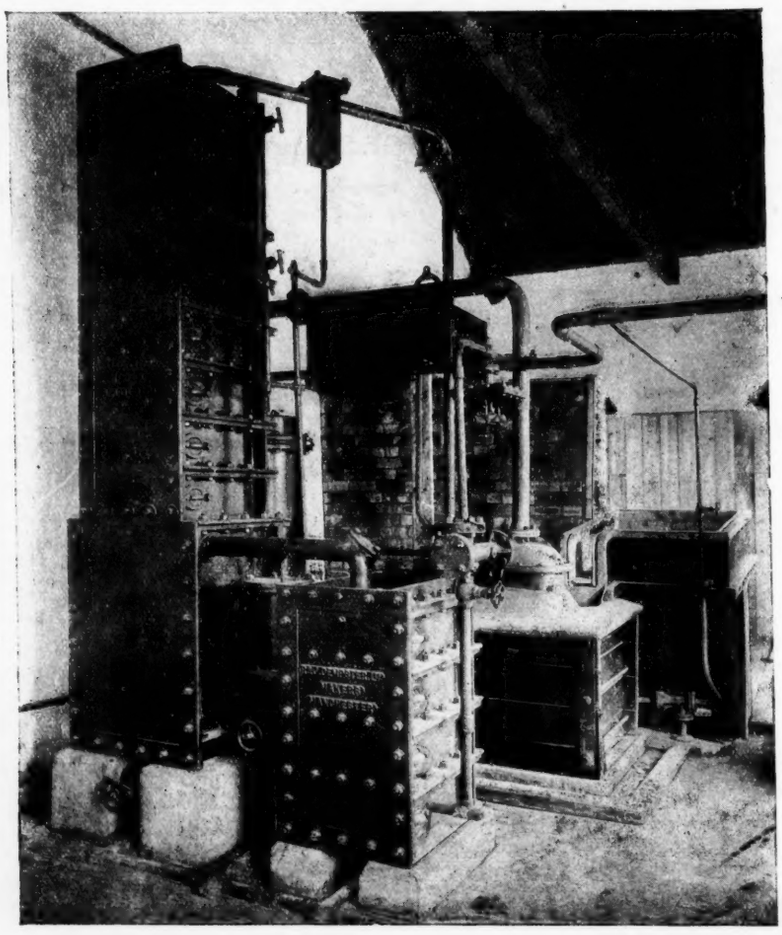
Strike at Cowes Gas-Works.—There was a stoppage of the gas supply of Cowes at noon on Saturday, in consequence of a strike of men employed at the gas-works. The men demanded a 47-hour week and increased pay, which the Gas Committee state were conceded after consultation with the men's representatives. The local branch of the Federation of Engineering and Shipbuilding Trades—who, it is alleged, were ignored by the District Council—however, contended that no settlement had been effected, and ordered a withdrawal of all the Council's men concerned—including the gas workers.

Gas Stokers' Wages at Airdrie.—The Gas Committee reported to a meeting of the Corporation of Airdrie that the stokers in the works had applied for an increase in their wages. The Manager (Mr. A. Kellock) submitted the award in the arbitration between the National Gas Council and the National Federation of General Workers, showing the increases awarded to the various classes of workers. The Committee, after consideration, recommended the Town Council to increase the wages of the stokers in the works by 10d. per shift, as from the first pay day in February last. In reply to the Provost, Mr. Kellock stated that this increase now raised the wages of the stokers to £4 3s. 8d. per week of 56 hours, which included the Sunday shift. The pre-war wage was 5s. 3d. per shift, or about £2 per week.

Swansea Gas Company's Good Fellowship Dinner.

A happy evening was spent at the Mackworth Hotel last Wednesday by the employees of the Swansea Gas Company, when their annual Good-fellowship Dinner took place. In addition to over a hundred of the Company's workpeople, there were present four of the Directors (Messrs. Frederic Edwards, the Deputy-Chairman, George Andrews, E. H. Leeder, and David Lewis). After the Loyal Toast, the Chairman (Mr. R. G. Clarry, the Engineer and Manager) referred to the great pleasure he felt at being among them in such circumstances, and trusted they would spend many such evenings together. The Company, he said, were very fortunate in their employees, who were well-tried, well-seasoned, and enthusiastic servants. If they had not been reasonable, he did not think it would have been possible for them to have carried on during the past few years. The war had tested them in all respects, both at home and abroad; and he was pleased to say the whole of the Company's employees without exception had, since a few days after the commencement of hostilities, subscribed originally to the Prince of Wales's fund, and subsequently to the Company's war relief fund—the latter fund being organized to relieve any distress among the Company's workpeople. Government Departments and the leading scientific men of the country were now realizing that the proper way to conserve the coal of the country was through the medium of gas-works. Responding to the toast of "The Swansea Gas Light Company," proposed by Mr. E. Ablett (Assistant Engineer), Mr. Frederic Edwards said he trusted the present spirit of good fellowship between the Directors and the employees would continue. He had perfect confidence in the future of the Company, both as regards the demand for gas and the sale of their bye-products. Mr. George Andrews, speaking in support, referred to his long connection with the Company, both as Manager and subsequently as a Director, and endorsed the feeling of confidence expressed by Mr. Edwards. Supporting the toast of "H.M. Imperial Forces," proposed by Mr. C. Standish (Rental Superintendent), Mr. F. G. Andrews (Assistant Manager) mentioned that 103 of the Company's employees had been on active service, and seven had been killed. The toast of "Our Guests" was proposed by Mr. G. Dean (Works Foreman, and Chairman of the Dinner Committee), and replied to by Mr. Leeder. A hearty vote of thanks was passed to the Chairman for presiding. There was a very enjoyable musical programme; and the whole of the arrangements were ably carried out by Mr. W. Crutchley (Hon. Secretary).

Prices and Costs at Doncaster.—On budget day at Doncaster, it was stated that, despite the advance in the price of gas and the imposition of meter-rents, the costs of coal and wages had increased so greatly that the Committee were still far from catching up to the extra outlay; and the end of the year saw a deficiency of £588 on the gas undertaking. It was hoped, however, that something better might be shown twelve months hence.



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Elstree and Boreham Wood Gas Company.

In a report to the Hertfordshire County Council, the Parliamentary Committee remark that the Elstree and Boreham Wood Gas Company, Ltd., are applying to the Board of Trade for a Provisional Order to empower them to construct apparatus and works on land adjoining the existing works at Boreham Wood. Under the Acts of 1872, 1899, and 1904, the Company have powers for manufacturing and supplying gas in the parishes of Elstree, Aldenham, Shenley, and Ridge, in the county of Hertford, and Little Stanmore in the county of Middlesex; and this area is not proposed to be extended under the proposed Order. There are 39 miles of main roads and 17 county and main road bridges situated in the district in which the Company have power to supply gas. Subject to an adequate clause being inserted in the Order to safeguard the interests of the County Council as regards main roads and bridges, there does not appear (apart from the financial questions involved) any objection to the extension of the Company's works as applied for under the Order. With reference to the financial aspect of the case, the Committee have considered the report of the County Accountant upon the accounts of the Gas Company for the past five years, from which it appears that the new capital sought by the Bill is £24,000, with a proviso that the total share capital shall not exceed £50,000, with borrowing power of one-third of the share capital and premiums received. New capital powers are, in fact, sought for £35,716. This amount appears to be excessive, in view of the fact that the capital expenditure during the last five years has averaged only £704 per annum, and that the increased sale of gas between the years 1914 and 1918 was only about 6,597,000 c.ft. The Committee consider it desirable to suggest to the Board of Trade that the excessive amount of capital power sought would be likely to have the effect of keeping the Company away from Parliament for an unduly long period, and that additional capital powers of (say) £20,000 would be very ample. The accounts for the last year show that the price charged for gas was unnecessarily high; there being a surplus revenue, after paying the dividends, of about £300, or equivalent to over 2d. per 1000 c.ft. The Committee are of opinion that the Order should be opposed, with a view to obtaining a reduction of the capital powers, and a clause for the protection of the main roads and county bridges. They have therefore caused objections to the Order to be delivered to the Board of Trade.

Gas-Works Contracts and Publicity.—At a meeting of the Salford Town Council last Wednesday, considerable opposition was offered to a resolution of the Gas Committee recommending the suspension of a standing order relative to the issue of advertisements for tenders of the value of £100, the resolution to affect every Corporation Department. Mr. Finburgh said that publicity was the breath of municipal life, and he warmly opposed any such resolution. Alderman Phillips remarked that £100 was not worth £50 to-day, and it was to save expense that the resolution was suggested. The Council refused to adopt the proposal.

Rising Costs at Rochdale.—The Rochdale Town Council, at a meeting last Thursday, decided to increase the price of gas for lighting purposes by 10d. to the maximum allowed of 5s. per 1000 c.ft., and for heating to 4s. 8d. Mr. Walker (the Chairman of the Gas Committee) said the rise was due to the increased price of coal and advances in wages. Their effect was an estimated deficit at the end of March of £5218. The wages bill was now £36,129; and there was a prospective one for the new financial year of £42,259. During the twelve months ended March, 1914, the wages amounted to only £18,524. If the 44-hour week were put into operation, it would mean a further increase of £11,167; while under a 48-hour week the extra payments would total £6762. Thus, with a 44-hour week, the total wages bill in the coming year would be £53,426, and with a 48-hour week, £48,961.

Drogheda Gas Prices.—On a letter from the Irish Local Government Board being read at a meeting of the Drogheda Corporation, stating that their Order authorizing the increase from 5s. 6d. to 6s., the maximum price chargeable for gas by the Corporation, affected the price of gas only after the date of the Order, Dec. 9 last, Mr. H. W. Saville (the Manager) said they applied last August for the Local Government Board's sanction to an increase of 1s. per 1000 c.ft.; and in due course the Corporation passed a resolution increasing the price by 9d. until October, subject to sanction, which was given. The Local Government Board only sanctioned 6d.; and the resolution was altered to make it 6d. They were, he held, entitled to charge 5s. 6d. per 1000 c.ft. net; whereas they had charged 5s. 8d. There were discounts, and many people had paid under 5s. 6d. Confusion had arisen through the Local Government Board not giving their sanction in time. It was agreed that application be made for sanction to a charge of an additional 6d. per 1000 c.ft. Mr. Saville said it was a matter of necessity that they should have this additional charge.

Londonderry Gas Company.—Mr. H. J. Cooke (the Chairman), in moving, at the recent meeting of the Company, the adoption of the report and accounts for the past year, said labour unrest and strikes, with demands for shorter hours and higher wages, were constantly occurring. As regarded their own works, in common with others, matters must soon mend, or there could be but one ending—the closing-down of many factories or works. The prospects for the coming year were not bright. Great unrest in the coal trade, with demands for higher wages, meant an increase in the cost of coal—already over 100 p.ct. higher than in pre-war days. Freight had been controlled, but at a figure nearly five times pre-war rates. Sometimes the supply of gas to the city had been maintained only with the greatest difficulty, owing to sickness. Frequently the staff of about a hundred had been reduced to about a dozen. Considering everything, however, they had every reason to be satisfied with the report and the result of the year's working. The heavy increase in labour cost must inevitably result in labour-saving appliances wherever possible, together with the erection of gas-producing plant of the very highest efficiency and the cheapest manipulation. The report was adopted.

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Gas Company Fined for Having Unjust Scales.

At Lewes, last Tuesday, among several summonses under the Weights and Measures Act, was one against the Newhaven Gas Company, who were summoned for having in their possession unjust scales and an unstamped weighing-machine. The defendants pleaded guilty. Mr. William Futcher, the Inspector of Weights and Measures, said that he cautioned the Company with regard to the weighing-machine in December last. When he examined it on Feb. 24, he found it was ½ lb. against the public; and had not certain pieces of lead been affixed to it, it would have been 7 lbs. out. The Bench imposed an inclusive fine of £10, and ordered the machine to be confiscated.

Cost of Public Lighting at South Shields.—In the South Shields Town Council, a letter was read from the local Gas Company stating that by reason of the abnormal conditions existing in relation to the costs of all material and labour caused through war conditions, the Company are unable to maintain the public lamps now in lighting at a loss; and seeing that the prices specified in the existing agreement were based upon pre-war rates, the Corporation are asked to favourably consider the granting of some concession in the price for maintenance and upkeep of the present lamps, and any prospective lamps required to be put into lighting. Some particulars were furnished of the increase the Company are paying over pre-war rates for material, together with the additional cost of upkeep of "full-lighting" lamps. A Sub-Committee were appointed to consider the application, and if necessary interview the Company.

Glasgow Gas Finances.—Reference was made by the Town Clerk at a meeting of the Glasgow Gas Sub-Committee to the terms of Mr. Justice Sankey's Coal Commission report, and to the expressions of opinion therein that the present price of coal is not likely to be increased by the recommendations in the report. The Committee, after hearing the Assistant General Manager (Mr. R. Halkett) as to the additional expenditure, amounting to about £70,000, involved in the adoption of the 48-hour week and otherwise for the year 1919-1920, and keeping in view the estimated deficit of £32,578 from the previous year, agreed to recommend that the present price of gas be increased 3d. per 1000 c.ft. At a subsequent meeting of the Gas Committee, there was submitted a financial statement showing the revenue and expenditure of the department for the years 1916-17, 1917-18, and 1918-19, as also the deficits of £21,917 for 1916-17, £68,006 for 1917-18, and an estimated deficit of £32,578 for 1918-19. There was also submitted an estimate of the revenue and expenditure of the department for the financial year commencing June 1 next—*i.e.*, for the year 1919-20—this estimate being made on the assumption that there will be increased expenditure due to a rise in the price of coal, wages, &c. The Committee discussed the question of the price to be charged for gas, but delayed further consideration of it.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for April 2.]

Nos. 7231—7979.

Allen, W. S.—"Gas-producers." No. 7469.
Anderson, C. E.—"Valves and cocks." No. 7390.
Antrobus, W.—"Treatment of fuels for obtaining bye-products therefrom." No. 7899.
Balfour-Guthrie Investment Company.—"Method of producing cyanogen and ammonia." No. 7403.
Beilby, Sir G. T.—"Carbonization of coal, shale, peat, &c." No. 7446.
Brassington, A. E.—"Gas-distribution systems." No. 7595.
Butler, B. & W.—"Stop-cocks or valves." No. 7397.
Clements, F.—See Allen. No. 7469.
Corthesy, J. H.—"Generation and treatment of gas." No. 7559.
Cox, W.—"Prepayment meters." Nos. 7928, 7934.
General Chemical Company.—"Apparatus for production of nitric acid." No. 7869.
General Chemical Company.—"Treating gases containing carbonic oxide." No. 7870.
General Chemical Company.—"Apparatus for absorbing gases from gaseous mixture." No. 7871.
General Chemical Company.—"Apparatus for synthetic production of ammonia." No. 7872.
Glover & Co., G.—See Cox. Nos. 7928, 7934.
Goold, R. L.—See Balfour-Guthrie. No. 7403.
Hayhurst, W.—"Gas fires, stoves, &c." No. 7838.
Kennedy, J. E.—"Rotary retorts, and destructive distillation of carbonaceous material therein." No. 7607.
Lawrence, F. J.—See Brassington. No. 7595.
Nelson, J.—"Distillation and carbonization of wood." No. 7353.
Pearse, A. L.—See Kennedy. No. 7607.
Pettitt, S. E.—See Brassington. No. 7595.
Schroeder, F. W.—"Bye-passes for incandescent gas-burners." No. 7455.
Seymour, G. E.—"Combustion of fuel." No. 7737.
Smith, J.—"Gas-fires." No. 7256.
Smoot, C. H.—"Regulation of pressure or volume of gases." No. 7502.
Stables, C. W.—See Cox. Nos. 7928, 7934.
Thiry, N.—"Distilling, carbonizing, and gasifying coal, &c." No. 7590.
Vinten, H. B.—"Laying pipe-lines." No. 7628.

APPLICATION FOR RESTORATION OF PATENT.

Notice is given that W. B. Bastian has made application for the restoration of the patent granted to him for "Improvements in gas water-heaters," No. 22061 of 1913, dated Sept. 30, 1912.

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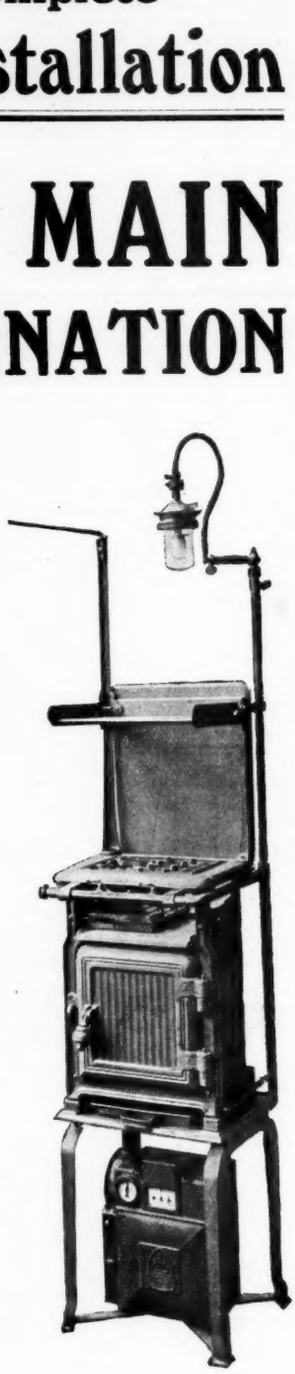

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Loss by Suspension of Public Lighting.—The Silsden Urban District Council Gas Committee propose to make a claim on the Council for compensation from the district fund for loss to the department by reason of the suspension of public lighting during the war. It is contended that it is only a case of transferring money from one fund to another, and the strongest fund should stand the loss. The matter has been referred for further consideration in committee.

The Nechells Gas Tragedy.—At a meeting of the Birmingham Watch Committee last Wednesday, a letter was read from Sir John Cadman, of the University of Birmingham (Chair of Mining), to the Lord Mayor, suggesting the organization of a rescue department. A communication was also read from Sir Hallewell Rogers (Chairman of the Gas Committee), expressing appreciation of the efforts of the fire brigade in connection with the accident, and sympathy with the relatives of the deceased. As to the proposed formation of a rescue brigade, the Sub-Committee were strongly of opinion that steps should be taken with this in view; and the Chairman and the Chief Officer of the brigade were appointed to confer with representatives of the Gas Committee and of the Mining Department of the University. A report is to be made on the subject.

Irish Town in Darkness.—The gas supply in Tralee (co. Kerry) gave out last Sunday week, owing to coal shortage; and the town was in darkness.

Proposed Vertical Retorts for Ballymena.—In a report on the Ballymena Gas-Works (submitted at a meeting of the Urban Council), by Mr. J. D. Smith, the Engineer and Manager of the Belfast Corporation Gas-Works, it was stated that the works, with the exception of the retort-bench and the station-meter, were in an excellent condition; and a recommendation was made that the Council should at an early date adopt the vertical retort system. A bench of eight retorts in units of two would, Mr. Smith said, be the best to adopt, and would meet the demands for gas for a considerable time to come. A bench such as that which he indicated would produce 250,000 c.ft. per day, as against present requirements of 25 million c.ft. per annum. The approximate cost of such a plant would be £13,000. The saving in working over the present system would amount to about £2000 per annum, which would meet interest and redemption and leave a considerable margin of profit. After discussion, it was decided that a deputation should visit the gas-works in Lurgan, Bangor, and Holywood, and report to the Council.

STOCK MARKET REPORT.

THE Stock Exchange week just closed did, on the whole, show some improvement over its predecessor, but not much. To begin with, at times there were faint signs of renascent activity discernible here and there; and these would have been greater but for the restrictions against "free dealing" imposed by the Committee. Market movements varied materially; but good points were presented in some departments.

The gilt-edged market was an example. Home Government issues opened with a flourish, and most of them (and Indian as well) had a good rise. This increased next day. Eventually, the 5 p.ct. War Loan touched 95 1/16; but Consols slipped back to their starting price. Home Rails found little support in spite of the Labour prospect looking brighter. Canadians were helped up by the exchange, and Argentines were irregular. In the Foreign Market, French Loans checked their fall and made a slight recovery. Japanese and Brazilian continued very firm. In the Miscellaneous group, there was good business in Oil, and the run on Insurance concerns continued.

Business in the Gas Market was much about the same as in the previous week in respect both of volume and of character—about half of it was concentrated in Gas Light and Coke and Imperial Continental, and the rest were supplemented by a strong contingent of "unquoteds." The tone on the whole was rather mixed; weak spots appearing here and there. In Metropolitans, Gas Light and Coke and Commercial were steady; but South Metropolitan was 1 lower. In Suburbans, South Suburban was firm. Continentals in general were not strong, and Imperial Continental fell 1½. Abroad, Melbourne Bonds rose on *ex div.* variations. Primitiva continued weak, but had no further fall.

Bargains done for cash during the week were as follows: On Monday, Bombay 6¼, Gas Light ordinary 62, 62¼, 62¾, 63, 63¼, ditto preference 71½, ditto debenture 57½, Imperial Continental 115½, 116, 116½, 116½, Primitiva 26s. 3d., ditto preference 45s., ditto debenture 75⅛, 75⅜, South Metropolitan 64, South Suburban 77½, 78½. On Tuesday, Cape Town, 4, 4½, Gas Light ordinary 62½, 62⅞, 63, Imperial Continental 115½, 116, 116½, Primitiva 24s., 26s. 3d., ditto preference 47s. 6d., South Metropolitan 64⅜, ditto preference 95½, Danish 9½, 9 9/16, Holyhead 5s. 4½d., Pinner 7 p.ct. "B" 5 7/16, 5⅝. On Wednesday, Commercial 4 p.ct. 62, 63, Gas Light ordinary 62, 62½, 62¼, 62 5/16, 62½, 62⅞, 63½, ditto preference 70⅜, 71, Imperial Continental 115¼, 116, Primitiva 23s., 24s. 9d., South Metropolitan 63½, 64, 64½, 64⅜, South Suburban 78, Brighton and Hove preference "B" 94⅜, Cape Town 5 p.ct. mortgage debentures 60½, Croydon "D" 5 p.ct. maximum 80, 80½. On Thursday, Gas Light ordinary 62, 62⅛, 62⅜, Imperial Continental 115, 115¼, 115½, 116, Primitiva 24s. 9d., ditto preference 47s. 3d., South Metropolitan 63, 64, South Suburban 77½, St. Albans 69½. On Friday, Buenos Aires 51, Commercial 4 p.ct. 63½, Continental Union 48, European 12⅜, 12⅞, 12 13/16, Gas Light ordinary 62, 62½, 62⅝, 63, ditto preference 71½, Imperial Continental 116, Primitiva debenture 74½, South Metropolitan 63½, 64. Brighton and Hove preference "B" 95.

In the Money Market, the release on Tuesday of War Bond dividends produced a superfluity and extremely easy rates. The Bank rate is 5 p.ct., as fixed on April 5, 1917.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue. £	Shares.	When ex-Dividend.	Ante-War Dividend & Bonus p.c.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
189,049	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	62—67	..
1,551,868	"	April 8	2½	4⅛%	Alliance & Dublin Ord.	59—64	49—51	..
274,000	"	July 10	4	4%	Do. 4 p.c. Deb.	76—79	61—63	..
280,000	5	April 22	7½	8%	Bombay, Ltd.	5⅞—6⅛	5⅝—6¼	6¼
50,000	10	Feb. 26	16	12%	Bourne-mouth Gas and Water { 10 p.c. / B 7 p.c. / Pref. 6 p.c. / 4 p.c. Deb.	28—30	21—23	..
868,110	10	"	7	7%		15—15½	10—11	..
115,000	10	"	6	6/-		18½—14	9—9½	..
159,740	—	—	—	4%		..	66—68	..
922,045	Stk.	Feb. 26	14	37/-	Brentford A Consolid.	261—266	76—79	..
784,920	"	"	11	31/8	Do. B New	204—209	70—75	..
55,000	"	"	5	5%	Do. 5 p.c. Pref.	109—111	75—80	..
231,400	"	June 11	4	4%	Do. 4 p.c. Deb.	91—93	64—66	..
317,880	"	Feb. 26	11	7½%	Brighton & Hove Orig.	208—213	137—142*	..
244,900	"	"	8	5½%	Do. A Ord. Stk.	154—159	94—99*	..
933,500	Stk.	—	5	5%	Bristol 5 p.c. max.	..	..	..
630,000	20	Mar. 26	12½	10%	British	44—45	30½—31½*	..
190,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	64—66	..
245,771	"	"	4	4%	Buenos Aires 4 p.c. Deb.	85—87	50—53	51
100,000	10	—	—	—	CapeTown & Dis., Ltd.	1½—2½	3½—4½	4—4½
100,000	10	—	—	4½%	Do. 4½ p.c. Pref.	4—6	7½—8½	..
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	60—65	..
157,150	"	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	..	..
1,513,380	"	Feb. 12	5/9/4	30/-	Commercial 4 p.c. Stk.	106—108	62—65	62—63½
580,000	"	"	5½	26/3	Do. 3½ p.c. do.	108—105	59—62	..
475,000	"	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	51—53	..
300,000	"	"	4	—	Continental Union Ltd.	76—79	48—53	48
200,000	"	"	7	—	Do. 7 p.c. Pref.	115—118	70—75	..
51,600	Stk.	Aug. 29	14½	12½%	Croydon A 10 p.c.	..	155—165	..
278,400	—	"	11½	9½%	Croydon B and C 7 p.c.	..	130—135	..
492,370	Stk.	—	6	6½%	Derby Con. Stk.	128—135	..	..
55,000	"	—	4	4%	Do. Deb. Stk.	102—104	..	..
1,002,180	10	July 29	10	5/0	European, Ltd.	17½—18	12½—13½	12⅞—12⅞
16,398,975	Stk.	Feb. 10	4/17/4	30/-	Gas Light and Coke { 4 p.c. Ord. / 3½ p.c. max. / 4 p.c. Con. Pref. / 3 p.c. Con. Deb. / 10 p.c. Bonds	98—102	62—64	64—63½
2,600,000	"	"	3½	26/8		76—79	55—57	..
4,082,285	"	"	4	4%		96—99	70—72	70⅞—71½
4,874,850	"	June 11	3	3%		72½—74½	56—58	57⅛
180,000	"	"	10	10%	Hastings & St. L. 5 p.c.	..	..	..
82,500	"	Mar. 12	5	4½%	Do. 3½ p.c.	87—89	59—61	..
368,740	"	—	3½	2⅜%	Hongkong & China, Ltd.	16½—16½	44—49	..
70,000	10	April 29	11	6%	Hornsey 7 p.c.	..	7½—8½	..
86,600	Stk.	Sept. 12	9	8½%	Ilford A and C.	151—154	115—120	..
131,000	"	Mar. 12	7½	5⅝%	Do. B	115—118	90—95	..
65,780	"	"	6⅔	4½%	Do. 4 p.c. Deb.	92—94	69—74	..
65,500	"	June 26	4	4%	Imperial Continental	150—160	92—65	..
4,940,000	"	May 14	9	4½%	Do. 3½ p.c. Deb. Red.	84—86	115—119	115—116½
1,295,000	"	Feb. 12	8½	3½%	Lea Bridge Ord. 5 p.c.	119—121	72—74	..
235,943	"	Mar. 12	6½	6½%	Liverpool 5 p.c. Ord. { A / B	211—213	90—95*	..
2,498,905	"	Feb. 26	10	42/6		146—148	..	..
806,088	"	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	..	..
165,736	"	Feb. 17	7/5/8	9⅜%	Maidstone 5 p.c.	..	58—63	..
15,000	5	June 11	6	8%	Malta & Mediterranean	4½—4⅝	3½—3⅞	..
250,000	100	April 1	4½	4½%	Met. of Melbourne 4½ p.c. Deb.	99—101	90—97*	..
541,920	20	May 28	4	5/-	Monte Video, Ltd.	11½—12	9⅜—9⅞	..
1,875,892	Stk.	July 29	4½	3⅜%	Newcastle&Gatsh'd Con.	98½—99½	70½—71½	..
539,705	"	June 26	3½	3⅛%	Do. 3½ p.c. Deb.	8⅝—88	67—69	..
55,940	10	Feb. 26	7/14/0	7/0	North Middlesex 7 p.c.	14—15	9½—9⅞	..
800,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	103—106	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7⅞	4⅜—5½	..
60,000	50	Feb. 26	13	7⅜%	Portsea, Island B	128—131	76—81	..
100,000	50	"	12	6⅞%	Do. C	118—121	58—63	..
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	1—1½	23/—26/3
499,960	5	June 26	5	—	Do. 5 p.c. Pref.	4½—5	2—2½	45/—47/6
621,600	100	June 2	4	4%	Do. 4 p.c. Deb.	91—98	74—76	74½—75½
600,000	Stk.	July 31	4	4%	Do. " " 1911	..	46—49	..
846,198	"	June 26	4	4%	River Plate 4 p.c. Deb.	85—87	48—52	..
150,000	10	May 14	8	6/-	San Paulo { 6 p.c. Pref. / 5 p.c. Deb.	10½—11	7½—8*	..
125,000	50	July 1	5	5%		47—49	40—42	..
135,000	Stk.	Mar. 12	10	5%	Sheffield A	228—234	83—85	..
209,984	"	"	10	5%	Do. B	223—224	83—85	..
528,500	"	"	10	4⅔%	Do. C	220—222	82—84	..
133,201	Stk.	Sept. 12	4	4%	Shrewsbury 5 p.c.	..	..	..
90,000	10	May 28	9	6/-	South African	10½—11½	13—14	..
6,609,895	Stk.	Feb. 10	5/4/0	30/-	South Met. 4 p.c. Ord.	111—113	63—66	63—64½
250,000	"	July 12	—	5%	Do. Pref.	..	95—97	95½
1,895,445	"	July 10	3	3%	Do. 3 p.c. Deb.	72½—74½	54—56	..
224,920	"	Feb. 26	5½	5%	South Shields Con. Stk.	157—159	112—114	..
952,795	"	"	6	3⅔%	S'th Suburb'n Ord. 5 p.c.	114—116	76—79	77½—78½
187,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	89—92	..
647,740	"	May 14	3	3%	Southampton Ord.	99—102	69—71	..
120,000	"	Feb. 12	7½	4½%	Tottenham { A 5 p.c. / B 3½ p.c. / 4 p.c. Deb.	135—138	90—95	..
782,975	"	"	6	3⅔%	District	115—117	65—67	..
181,255	"	June 26	4	4%		87—89	64—66	..
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	..
236,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max.	103½—109	83—85	..
30,000	"	Feb. 26	8½	55/-	Wandsworth, Wimbledon, and Epsom—Wandsworth A 5 p.c.	151—156	88—93	..
255,838	"	"	6½	40/-	Do. B 3½ p.c.	129—134	68—73	..
108,075	"	"	—	38/6	Do. C	..	68—73	..
140,865	"	"	—	38/6	New Ordinary	..	68—73	..
362,000	"	"	6½	33/9	Wimbledon 5 p.c.	117—122	63—73	..
98,000	"	"	6⅔	40/-	Epsom 5 p.c.	121—126	70—75	..
83,416	"	June 26	3	3%	3 p.c. Deb. Stk.	66—69	50—52	..

* *Ex div.*

The Runcorn Gas Company have placed an order with Messrs. Bale & Hardy for a Tully patent carburetted hydrogen plant of a capacity of 300,000 c.ft. per day.

Referring to a recent report that the Hawick Gas Company had decided upon adopting vertical retorts, we learn that the order for these has now been placed with Messrs. Robert Dempster & Sons, Ltd., for their "Dempster-Toogood" continuous system of verticals. The plant has to be complete with all appurtenances for steaming and the mechanical handling of all coal and coke, &c.

At the last meeting of the Birmingham Education Committee, a report was submitted by the Technical Education and Evening Schools Sub-Committee dealing with the arrangements which it is proposed to make for the provision of temporary accommodation for the training of gas-fitters and gas-fitters' assistants in the employ of the Corporation Gas Department who are now returning from service in the army. The accommodation required will be provided at the Technical School Extension, Rosebery Buildings, John Bright Street.

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Address, No. 6631, care of Mr. KING, 11, BOLT COURT, FLEET STREET, E.C. 4.

FOREMAN-REPRESENTATIVE desires Position where his Practical and Commercial Knowledge of Hot-Water, Coal, Oil, Petrol, and Acetylene Gas Plants could be used to advantage. Competent to Interview, Estimate, and Supervise Installations. (Age 38.)
A. E. F., 29, THORNFORD ROAD, LEWISHAM, LONDON, S.E. 13.

No. 6599.

APPLICANTS under No. 6599 are THANKED, and Informed that the POSITION ADVERTISED HAS NOW BEEN FILLED.